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LOS ANGELES REACTIVE POLLUTANT PROGRAM (LARPP) DATA ARCHIVING AND RETRIEVAL

R. O. Parker, et al

Environmental Research and Technology, Incorporated
Santa Barbara, California

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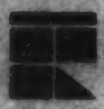

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ABSTRACT

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1. INTRODUCTION

This report describes the automatic data retrieval program designed for use in conjunction with the data archive of the Los Angeles Reactive Pollutant Program (LARPP). In addition, the report documents the contents and layout of the data archive itself.

The LARPP retrieval program (called REPLEVY, another word for retrieval) has been designed to be of general utility in the selection of data from the archive in order to create ad-hoc reports and plots of that data. The program design is flexible to the extent that it may be utilized with other data structures as well. This has been accomplished by providing the ability to input file and record specifications which direct the program retrieval logic. In essence, an interpretative retrieval language has been developed which permits user specification of the data structure as well as data selection criteria and the desired report contents.

In the next section we describe the retrieval specification language. Several examples of the use of the retrieval program are also included in Section 2. The current program implementation and machine dependencies associated with that implementation are discussed in Section 3.

The contents of the LARPP archive are described in Section 4. That section contains detailed specifications of the different types of data found in the archive, including the format associated with each data type.

Appendixes I, II and III contain lists of the data inputs required for use with the retrieval program, a listing of the computer program, and a description of the methods used to correct some of the data in order to compensate for instrumental deviations. It should be noted that for various reasons the LIDAR data have been treated in a manner different from the other archive data. Accordingly, Appendix IV describes in detail the treatment of the LIDAR data and how to access it on the tape. Finally, Appendix V lists the contents of the magnetic tapes.

2. RETRIEVAL PROGRAM DESCRIPTION

2.1 Retrieval Language Constructs

Thirteen distinct statement types are processed by the retrieval program, each statement of type being identified by a keyword. The statement types and keywords are shown in Table 1.

TABLE 1 Statement types and keywords for LARPP Retrieval Program

Statement Type	Keywords
1. File definition	FILE
2. Record definition	RECORD
3. Field definition	FIELD
4. Section specification	SELECT
5. Tabulation specification	TABULATE
6. Scale specification	SCALE
7. Plot specification	PLOT
8. Heading specification	HEADING
9. Copy specification	COPY
10. Compute specification	COMPUTE
11. Define specification	DEFINE
12. Listing controls	LIST; NOLIST
13. Comment statements	*(Asterisk in column 1 of input card)

All statements have essentially the same format. That is, the statement type (keyword) is entered first followed by a comma (,) and the list of parameters (separated by commas) appropriate to that statement type. The statement format is free-field, all blank characters are ignored.

Parameters may be alphabetic or numeric (both integer and real number formats are allowed). If a parameter begins with a numeric character it is assumed to be numeric unless an alphabetic character is encountered. Numeric parameters which need to be treated as alphabetic (e.g., for the purpose of record select comparisons) can be forced into that mode by preceding them with a slash (/) character. Examples of various parameters are given below.

Parameter	Assumed Mode
ABCD	Alphabetic
A2C3	Alphabetic
1BCD	Alphabetic
1234	Numeric (Integer)
.234	Numeric (Real number)
0.51	Numeric (Real number)
/.89	Alphabetic
/135	Alphabetic

Each statement can accommodate no more than ten parameters (including the keyword). Any greater number of parameters will be ignored.

2.1.1 File Definition

The FILE definition statement describes the characteristics of the intended input medium. The program allows only one file definition statement to be input. The format of this statement is given below:

FILE,logical unit,recording mode,max-record-length

The keyword "FILE" identifies this statement type. Three parameters are required:

1. Logical unit: This must be a numeric value that identifies the equipment/unit number of the file to be processed. The unit number will be used in the retrieval program (in the FORTRAN sense, e.g., READ LUN, where LUN is the logical unit number) to input data from the file.
2. Recording mode: This parameter must be one of two possible values: BCD or BIN. BCD specifies that the input data

file is recorded in Binary Coded Decimal format (even parity). BIN specified that the file is recorded in pure BINary format (odd parity).

3. Max-record-length: This parameter declares the size of the longest single data record. The given size must be a character count.

2.1.2 Record Definition

The RECORD definition statement is used to describe each unique record type within the data file. No more than 30 unique record types can be defined. The format of this statement is given below:

RECORD,record name,number of fields,key position,key value,
key length

The keyword "RECORD" identifies this statement. Five parameters are required. In addition, three optional parameters may be specified:

1. Record name: This is an arbitrary alphabetic name (from 1 to 7 characters in length) which is used to later reference this particular record structure.
2. Number of fields: This parameter is a numeric value (an integer) specifying the number of data divisions or fields within the record.
3. Key position: This parameter defines the character position (leftmost) within the record that begins a field containing a unique character string that identifies this record.
4. Key value: This parameter specifies the exact character string that will be utilized in comparisons to ascertain unique record identification. The string must be alphabetic

or numeric forced into alphabetic mode using a leading slash (/) character.

5. Key length: This must be a numeric value from 1 to 10 that specifies the length of the record identifier field (key).
6. Three optional parameters may be included to further identify the record. These are identical in format and usage to those given in items 3-5 above. They merely serve to more uniquely define the record. If given, both key-values must be equal to the specified fields in the input data for the record to be identified.

Immediately following each RECORD statement, the exact record format must be defined. This is accomplished using a FORMAT statement (in the FORTRAN sense) to specify the procedure for decoding the record. The form of this statement is given below:

FORMAT(fd_1, fd_2 .....fd_n)

The field descriptors (fd_i) are the usual FORTRAN format elements as given below:

Element	Description
An	Alphabetic field, "n" characters in length.
En.d	Real numeric field (floating point) expressed in "scientific notation" (mantissa ± exponent) "n" characters in length with "d" characters to the right of the decimal point.
Fn.d	Real numeric field (floating point) expressed in conventional decimal notation "n" characters to the right of the decimal point.
In	Integer numeric field "n" characters in length.
nX	Skip "n" characters in the record.

An example of a typical FORMAT statement is given below. Other examples may be found in Sec. 1.2 of this report.

FORMAT (I2,5X,F5.1,F6.2,E13.6,A4)

This specifies that the first two characters of the record are to be treated as a two-digit integer field (field #1). The next five characters are to be skipped (ignored). The next 24 cnaracters are to be input as three real (floating point) numbers whose field lengths are 5, 6, and 13, respectively. The first field of these three is expressed in conventional decimal notation with one digit to the right of the decimal point (which may be present in the record or may merely be implied). The second field has two decimals, while the third is expressed in scientific notation as mantissa and exponent ($\pm$ m.mmmm $\pm$ eee). The fifth field described in the FORMAT statement is identified as a four-character alphabetic character string.

2.1.3 Field Definition

The FIELD statement defines the nature of the data fields which are to be read according to the FORMAT statement given above. The maximum number of field statements allowed is 1100.* The form of this statement is:

FIELD,field name,field number,field length,mode

The keyword FIELD identifies this statement type. Four parameters are required:

1. Field name: An arbitrary alphabetic name (1-7 characters in length) which is used to later reference the pertinent field specification.
2. Field number: This parameter is used to address the field within the data record. Field numbers exactly correspond

*This limit satisfies the number of fields defined in Appendix I.

(in an increasing monotonic sequence) to the format elements specified in the FORMAT statement, e.g., field no. 3 is the F6.2 in the example ("skipped" fields are not counted).

3. Field length: This is a numeric (integer) parameter specifying the length of the field in characters.
4. Mode: This specifies the internal form of the data. The parameter is a single alphabetic character selected from the set (A, I, R); where, "A" specifies an alphabetic field, "I" specifies an integer and "R" specifies a real (floating point) number.

2.1.4 Select Specification

The SELECT statement is first in the set of imperatives whose purpose is to control the processing logic of the retrieval program. SELECT provides the capability for selective retrieval of data based upon the content of specified fields within the indicated record type. Selection may employ both logical products and logical sums of the individual field comparison criteria. This permits the user to employ highly complex selection specifications to meet his retrieval requirements. The format of this statement is given below:

SELECT,{record name} {,field name,from-value,to-value}

The keyword "SELECT" identifies this statement. The braces identify optional parameters. In effect, either just the record name may be specified, or, both the record name and the field parameters may be given. These are described below:

1. Record name: This is an alphabetic parameter which references a previously defined record name (refer to Sec. 1.1.2).

2. Field parameters: Three parameters are required to establish selection criteria based upon the contents of a specified field:

   a. Field name: This is an alphabetic parameter which references a previously defined field name (Sec. 1.1.3).

   b. From-value: This is a data value which establishes a lower threshold for comparison with the specified data field.

   c. To-value: This is a data value which establishes an upper threshold for comparison with the specified data field.

Both the "From-value" and "To-value" must be specified in the same data mode as the referenced field. That is, if the FIELD definition declares the field to be "integer" (real, alphabetic), then, integer (real, alphabetic) values must be given for these parameters.

If only the "Record name" parameter is given, record selection will be based solely upon recognition of the specified record type. If field parameters are also included, the input data field must contain a value which falls between (or includes) the lower and upper threshold parameters. If more than one data field is required to be within specified thresholds to effect selection (logical product function), then, succeeding SELECT statements which specify the appropriate field parameters should not contain a record name specification. For example:

```
SELECT,RECORD,FIELD-A,25,67
SELECT,,FIELD-B,ABC,ABC
```

specifies that a record named "RECORD" is to be selected; further, data field named "FIELD-A" must contain a value which is equal to or

between 25 and 67, and, data field named "FIELD-B" must contain the character string "ABC."

Succeeding SELECT statements which do contain a record name will constitute an alternative selection specification (logical sum). Therefore, selection sequences such as,

A and B and C or D and E and F or G ...

can be implemented using various combinations of SELECT statements.

2.1.5 Tabulate Specification

For each sequence of SELECTs it is possible to extract data from the qualifying records for inclusion within a printed report. The TABULATE specification provides the ability to declare the items to be printed and the form they will take on the hard copy output. The format of this statement is given below:

$$\text{TABULATE,} \left\{ \begin{array}{l} \underline{\text{recordname,fieldname,format}} \\ \underline{\text{fieldname,format}} \end{array} \right\} \left\{ \right\}, \text{fieldname,format} \left\{ \right\}$$

The keyword "TABULATE" identifies this statement. The first parameter set offers a choice whether to include a record name as the first parameter or simply a field name and output format. The second parameter set implies that specification of additional fields and their output formats is possible. Up to four sets of field/format specifications are allowed (remember: only ten parameters are allowed per statement). The definition of the above parameters is given below:

1. Record name: This is an alphabetic parameter which references a previously defined record name (Sec. 1.1.2).
2. Field name: This is an alphabetic parameter which references a previously defined field name (Sec. 1.1.3).

3. Format: This is a FORTRAN-compatible output format specification which may be identical to the input format defined in Sec. 1.1.2. The format must be identical in mode to the data field to be printed. In effect, integers must be printed in "I" format, real numbers in "E" or "F" format or alphabetic data in "A" format.

The format specification may expand the field width or number of decimals to ensure clarity in the output, however, a single space is automatically supplied by the tabulation logic to separate printed data items. Multiple tabulation statements may be supplied and their indicated fields will be horizontally concatenated with previously specified fields to establish the overall report content.

The specification of a record name as the first parameter on a TABULATE statement will cause the associated fields on that statement to be printed only if the record to which they apply has been selected. If the fields named in the statement are not contained within the currently selected record, blank characters will automatically be supplied, in their stead, on the printed output. If a record name is not supplied, it will be assumed that the indicated fields are always available from the currently selected record for inclusion in the printed report (certain fields may be contained in the same relative position in all records).

A tabulation is produced on a selected record by record basis. The tabulation will include page headings which incorporate the indicated field names as column headings for the printed values.

2.1.6 Scale Specification

For each sequence of SELECT statements, it is possible to generate printer-produced plots of the data extracted from qualifying records.

In order to establish the range of values to be represented in the plot, the SCALE statement is utilized. The format of this statement is given below:

SCALE,min-value,max-value

The keyword "SCALE" identifies this statement type. Two parameters are required:

1. Min-value: the minimum value of data fields to be included within the plot (input as a "real" number in Fn.d format).
2. Max-value: The maximum value of data fields to be included within the plot (input as a "real" number in Fn.d format).

The specified values correspond to the ordinate of the plot.

One hundred (100) print positions are utilized to represent the specified range (from minimum to maximum) of the plot. Therefore, careful selection of the "min" and "max" values is advised in order for reasonable resolution between data values to be reflected in the plot. Data which exceed the minimum or maximum values given will be plotted at the respective extremes of the plot in special overflow (underflow) columns.

2.1.7 Plot Specification

The PLOT specification, like TABULATE, provides the ability to extract various data from currently selected records for plotting within the printer-frame defined by the SCALE statement. The horizontal frame of the printer-produced plot is separated into 100 divisions to represent the range of values specified in the SCALE statement. Therefore, data within the fields specified in the PLOT statement are

rescaled according to this range and are plotted within the frame, if possible, or are plotted as overflow or underflow points in columns reserved for this purpose. The format of the PLOT statement is given below:

$$\text{PLOT,} \left\{ \begin{array}{l} \text{recordname,fieldname,plot symbol} \\ \text{fieldname,plot symbol} \end{array} \right\} \left\{ \right\} \left\{ \text{,fieldname,plot symbol} \right\}$$

The keyword "PLOT" identifies this statement. The first parameter set offers the choice of whether to include a record name as the first parameter, or simply a field name and the print character to be output for that field. This first set is plotted as the abscissa of the graph. The second parameter set defines that the specification of multiple fields/symbols is allowed. Up to four sets of field/symbol specifications are allowed. The second through fourth sets are plotted as ordinates on the graph. The definition of these parameters is given below:

1. Record name: This is an alphabetic parameter which references a previously defined record name.
2. Field name: This is an alphabetic parameter which references a previously defined field name.
3. Plot symbol: This is a single numeric or alphabetic character that will be printed in the plot-location determined by the value in the specified data field.

If a data field included in the PLOT statement has been defined as "alphabetic" in the FIELD specification, then the field contents will be printed rather than plotted. This permits certain identifying data to be included on the plots. Approximately twenty (20) characters of data can be accommodated in this fashion. The "plot symbol" parameter for these fields is required and must be specified as "empty" by leaving the field blank as in the example below:

```
PLOT,RECORD,TIME,,VALUE,*
```

The parameter "TIME" is assumed to have been previously defined as an alphabetic field. The double comma following this parameter indicates that the plot symbol parameter is null (empty). The contents of the TIME field will be printed on the plot as the abscissa. The field named "VALUE" will be appropriately scaled and the result will be printed as the ordinate of the graph with the plot symbol "*".

The specification of a record name as the first parameter of a PLOT statement will cause the remaining fields on that statement to be plotted (or printed) only if the record to which they apply has been currently selected. If the fields do not match those in the current record, blank characters will be supplied for fields to be printed and plot fields will be ignored. If a record name is not supplied, it is assumed that all fields on the PLOT statement exist in all records to be selected.

Plot lines are produced on a record by record basis. The output will include page headings as well as scale factors for the body of the plot. The relationship between fields to be plotted and their associated plot symbols is assumed to be known to the user.

2.1.8 Heading Specification

In the event that custom page headings are desired for printed tabulations, the user may specify his own by use of the HEADING statement. If this statement is used, the default column headings normally printed on tabulations will be suppressed and the user-supplied headings will be used instead. The format of the HEADING statement is given below:

$$\text{HEADING,} \left\{ \begin{matrix} \underline{\text{L}} \\ \underline{\text{R}} \end{matrix} \right\} \text{, } \langle \text{up to 68 characters of heading} \rangle$$

The first parameter of each statement specifies whether the heading data is to be printed on the left (L) or right (R) half of the printed page. If a given page heading consists of more than 68 characters, it will need to be represented on two statements (one with an "L" as the first parameter; the other with an "R"). When the first parameter is an "R", its matching left-half must immediately precede it (right-half-only headings are not allowed).

Heading specifications must immediately precede their corresponding TABULATE statements. Multiple heading lines are allowed and up to 20 heading lines (for all tabulations) may be specified.

2.1.9 Copy Specification

If the user desires to copy selected records to another file for further processing, this ability is provided by using the COPY statement whose format is shown below:

```
COPY, lun
```

The only parameter required is the logical unit number (lun) of the file to which the data is to be copied. Only one COPY statement is allowed for each group of SELECT statements. However, up to 20 select-groups are permitted.

An example of the use of COPY is given below:

```
SELECT,RECORD1
COPY,2
SELECT,RECORD2
COPY,3
```

2.1.10 Compute Specification

Users who wish to perform computations on selected records may accomplish this by use of the COMPUTE statement whose format is given below:

COMPUTE, <alphabetic parameter>

The parameter which appears on the COMPUTE statement is passed (along with others) to a user-supplied subroutine called "PROCES." The exact calling sequence is given below:

CALL PROCES(record,index,select group,compute parameter)

where, "record" is the address of the record definition array and "index" is the offset in that array. Through inspection of the contents of this array entry, the user may ascertain features of the record which has been selected for computation. The information in each table entry is given below:

RECORD(1,index) = Record Name

RECORD(2,index) = Number of Fields

RECORD(3,index) = Record-Key Character Position

RECORD(4,index) = Key Value

RECORD(5,index) = Key Length

The argument "select group" is the sequential number assigned to each group of selects in the user's set of retrieval statements (in effect, the first group of selects is assigned select-group-1; the second is assigned select-group-2...etc.). The fourth parameter is the one included on the COMPUTE statement and is assumed to be an alphabetic value.

A user who wishes to use the COMPUTE feature will need to provide a subroutine called "PROCES" which may be structured as in the example given below:

```
      SUBROUTINE PROCES(RECORD,I,KG,IPAR)
      INTEGER RECORD(8,30)
      { other user-supplied declaratives
      { may be added here
      COMMON//INP(150),IDEC(300)
      { the computational program
      { statements go here
      RETURN
      END
```

The two arrays in "blank-common" (INP and IDEC) correspond to the record input area and the decoded data fields, respectively. The correspondence between data items and their positions in the decoded data array is provided by the "field number" parameter which is given on each FIELD statement defining that data item. Therefore, IDEC(1) will correspond to field-number-1 for the particular record being processed. If certain of the data fields in the decoded record contain "real" values, the user should equivalence another array to IDEC such that arithmetic or replacement statements which reference these values can do so without erroneous mode conversions taking place. For example, if the third data item in IDEC is a real number, it may be operated upon as shown below:

```
      COMMON//INP(150),IDEC(300)
      REAL DECODE(300)
      EQUIVALENCE(DECODE(1),IDEC(1))
      :
      :
      DECODE(3) = DECODE(3) * 2.71323
      :
      :
```

By utilizing the COMPUTE feature, the user may alter the data within selected records, store the data back into the two arrays (INP and IDEC) and tabulate the results of his efforts or copy the modified records to another file. The subroutine PROCES must be provided even if the user does not wish to use the COMPUTE feature. In such a case the subroutine PROCES can be a dummy routine.

2.11 Define Specification

This statement provides the user with the ability to define data fields whose contents depend upon parameters supplied in the statement itself (normally, data content is determined by values contained in the data records). The content of each defined field is changeable and may be used as the basis for SELECTs or may be tabulated by the user. Each time that a DEFINE statement occurs in an enabled select group, the field contents are changed to correspond to the supplied parameter value. The format of this statement is given below:

```
DEFINE,name,contents
```

The "name" may be any unique field name desired. The "contents" parameter is assumed to be an alphabetic value which will be placed into the newly-defined field upon each occurrence of the DEFINE in the processing sequence. An example of the use of this statement is given below. It is assumed that the first occurrence of the value "BEGIN" in the field "STATUS" for record "DATA" is the signal to begin tabulations for that record-type and that the occurrence of the value "END" in that field is the signal to terminate any tabulations of that data. The complete example of the implementation of this requirement follows:

```
FILE,1,BCD,100
RECORD,DATA,4,1,A,1
FORMAT(A1,A5,2F6.2)
```

```
FIELD,TYPE,01,1,A
FIELD,STATUS,02,5,A
FIELD,VALUE1,03,6,R
FIELD,VALUE2,04,6,R
SELECT,DATA,STATUS,BEGIN
DEFINE,START,YES
SELECT,DATA,START,YES
TABULATE,DATA,VALUE1,F6.2,VALUE2,F6.2
SELECT,DATA,STATUS,END
DEFINE,START,NO
```

In this example we wish to define a new field called "START" and set its contents equal to "YES" when the word "BEGIN" has been found in the previously defined record named "STATUS." This is accomplished by the sequence

```
SELECT,DATA,STATUS,BEGIN
DEFINE,START,YES
```

The tabulation of the fields VALUE1 and VALUE2 then proceeds only when the new field "START" is equal to "YES." Thus, the net effect of the command sequence

```
SELECT,DATA,START,YES
TABULATE,DATA,VALUE1,F6.2,VALUE2,F6.2
SELECT,DATA,STATUS,END
DEFINE,START,NO
```

is to tabulate VALUE1 and VALUE2 when "START" is set to "YES" and to inhibit the tabulation when both the word "END" is found in field "STATUS" and field "START" is set to "NO."

2.1.12 Listing Controls

Two additional statement types are defined which control the listing of input statement specifications. These are given below:

1. NOLIST: provides the ability to suppress listing of all succeeding input statements until a LIST directive is encountered.
2. LIST: provides the ability to re-establish listing of all succeeding directives.

Neither LIST nor NOLIST is printed on the input statement list printout. The statements included within NOLIST-LIST occurrences, however, are processed in a normal fashion.

2.1.13 Comment Statements

Any input statement which has an asterisk (*) in column-1 is treated as a comment. Therefore, input statement sets can be documented as to the action they specify to be accomplished. Comments are not allowed to be present on the standard statement forms described in Secs. 1.1.1 through 1.1.12.

2.2 Retrieval Examples

The examples contained in this section are based on the data base collected during the LARPP operations. This data base contains records of reactive pollutant data collected from any different sources (instrumented helicopters, ground stations and moving ground vehicles) and combined into a comprehensive file of related measurements. The common relationship between the various data records is the collection time of each sample, therefore, the file is organized in

strict chronological sequence. Two of the various record types (collection sources) represented in the file are listed below:

1. Helicopter Data Acquisition: Two helicopters operating separately or concurrently are collecting data at different altitudes.
2. Van Data Acquistion: A ground-based moving vehicle is recording pollutant data in the same vicinity as the helicopters (their positions projected to ground level).

The retrieval examples will specify selected portions of helicopter and van data to illustrate use of the retrieval program. The file, record and field definitions that have been developed for these data are illustrated in Fig. 1. Each of the examples given in the following sections will assume that the definitions shown in Fig. 1 have been established and precede the selection, tabulation or plot specifications in the set of retrieval parameters unique to that example.

2.2.1 Simple Tabulations

In order to tabulate certain data fields for all helicopter and van records in the file, the following set of commands is all that is required.

```
{FILE,RECORD,FIELD DEFINITIONS}  - - See Fig. 1
TABULATE,TIME,A6
TABULATE,HELIO,ID,A2,TEMP,F6.2,03.F6.2
TABULATE,HELIO,CO,F6.2
TABULATE,ARBVAN,03,F6.2,CO,F6.2
```

```
*************************************************************************
*     H E L I C O P T E R   R E C O R D   D E F I N I T I O N S         *
*************************************************************************
FILE,1,nCD,1310
RECORD,HELID,25,1,/01,2
FORMAT(A2,A6,1X,A1,80X,A3,A1,A2,2A6,2A4,A2,F4,9F6.2,4F5.1)
FIELD,TYPE,01,2,A
FIELD,TIME,02,6,A
FIELD,TN,03,1,A
FIELD,JULD,04,3,
FIELD,bT,05,1,A
FIELD,ID,06,2,A
FIELD,CHANV,07,6,A
FIELD,T     ,08,6,A
FIELD,T-XP  ,09,4,A
FIELD,T-YP  ,10,4,A
FIELD,bSAMP,11,2,A
FIELD,FPT   ,12,4,R
FIELD,NO    ,13,6,R
FIELD,NOX   ,14,6,R
FIELD,HSCT  ,15,6,R
FIELD,CO    ,16,6,R
FIELD,TEMP  ,17,6,R
FIELD,DEWPT,18,6,R
FIELD,NMHC  ,19,6,R
FIELD,CH4   ,20,6,R
FIELD,O3    ,21,6,R
FIELD,X-POS,22,5,R
FIELD,Y-POS,23,5,R
FIELD,MSL   ,24,5,R
FIELD,AGL   ,25,5,R
*************************************************************************
*     A R B - V A N   R E C O R D   D E F I N I T I O N S               *
*************************************************************************
RECORD,ARBVAN,15,1,/02,2
FORMAT(A2,A6,62X,A6,7F6.2,I1,2F4.1,2F3)
FIELD,TYPE  ,01,2,A
FIELD,TIME  ,02,6,A
FIELD,T     ,03,6,A
FIELD,CH4   ,04,6,R
FIELD,O3    ,05,6,R
FIELD,NO    ,06,6,R
FIELD,NOX   ,07,6,R
FIELD,TOTHC,08,6,R
FIELD,CO    ,09,6,R
FIELD,FPT   ,10,6,R
FIELD,MS    ,11,1,I
FIELD,X-POS,12,4,R
FIELD,Y-POS,13,4,R
FIELD,TEMP  ,14,3,R
FIELD,HUMID,15,3,R
**
```

Figure 1. File, record and field definitions for helicopter and van records.

In this example we wish to tabulate the time fields of the helicopter and van files. The retrieval program will print the time in format A6 whenever the field TIME is encountered. Note that the field called TIME is the second field specified in Fig. 1 for both the helicopter and van records. The field specification in Fig. 1 is

```
FIELD,TIME,02,6,A
```

which means that the field is called "TIME," is the second in the data set (02), has 6 characters, and is an alphabetic field (A). In Fig. 1 the second field in the FORMAT statement which immediately precedes the FIELD specifications, contains the format A6 and corresponds to the time field. The resulting tabulation is shown in Fig. 2.

In addition to listing all the times for both kinds of record we wish to tabulate certain fields of the helicopter and van records. For the helicopter we want to tabulate the fields called ID,TEMP,03,CO; for the ARBVAN we want to tabulate the fields 03 and CO. The specifications

```
TABULATE,HELIO,ID,A2,TEMP,F6.2,03,F6.2
TABULATE,HELIO,CO,F6.2
TABULATE,ARBVAN,03,F6.2,CO,F6.2
```

state that the record called HELIO will be sought and, when encountered, we will tabulate the field ID with format A2, the field TEMP with format F6.2, the field 03 with format F6.2, and the field CO with format F6.2. Similarly, when the record defined as ARBVAN is found, we will obtain tabulations of fields 03 and CO with format F6.2. From Fig. 1 it can be seen that for the helicopter record the desired fields are in positions 6, 16, 17, and 21; for the ARB-VAN the fields are in positions 5 and 9. Note that the formats specified in the

```
L A R P P  RETRIEVAL TABULATION  P A G E  3          OPERATION 01        091173

TIME      ID   TEMP      03        CO        03        CO

015002
015100
015300
015500
015500
015600
020000
020000
020000
020000
020000
020000
020000
020000
020000
020000
020000
020000
020000
020000
020000
020000
020000
020000
020000
020000
020000
020000
020000
020000
020000
020000
020000
020002
021002
022002
023003
024003
024500
024700
025002
025300
025500
025500
025600
030000
030000
030000
030000
030000
030000
030000
030000
030000
030000
030000
030000
030000
```

Figure 2. Sample of tabulation of time field.

TABULATE statements correspond to the formats defined in the FORMAT statement for each appropriate field. For example, for the helicopter, field number 6 is the ID field and the sixth format parameter in the FORMAT statement is A2; the other format parameters of the tabulated fields are shown below.

```
FORMAT(A2,A6,1X,A1,80X,A3,A1,A2,2A6,2A4,A2,F4,9F6.2,4F5.1)
                              ↑                 ↑
                           Field 6          Fields 13-21
```

Similar considerations apply to the van data. Portions of the tabulations are shown in Figure 3.

We emphasize, however, that it is not required that the format defined in the TABULATE statement must match that in the FORMAT statement. Thus, for example, we could have tabulated the temperature and 03 using other formats by using a TABULATE statement as shown below:

```
TABULATE,HELIO,ID,A2,TEMP,F9.3,03,F8.4
```

The only requirement is that the variable type in the TABULATE statement must match the type specified in the FIELD statement. For example, real variables must be tabulated using a format appropriate for real variables. The same applies to integers and alphanumeric variables.

2.2.2 Tabulations with Selection

If a certain subset of the data are to be selected for tabulation, the input parameters might be coded as follows:

```
{FILE,RECORD,FIELD DEFINITIONS}  - - See Fig. 1
SELECT,HELIO,03,0.08,0.50
TABULATE,TIME,A6,03,F6.2,CO,F6.2
```

In this case the SELECT statement causes data to be listed only when the data for the field 03 is in the range $0.08 \leq 03 \leq 0.50$. Whenever 03 has a value in this range the program will list the fields TIME, 03 and CO with the formats A6, and F6.2. The resulting tabulation is shown in Fig. 4.

2.2.3 Simple Plots

Plots of selected data can easily be developed. An example of this capability is given below:

```
{FILE,RECORD,FIELD DEFINITIONS}  - - See Fig. 1
SCALE,0.0,0.5
PLOT,HELIO,TIME,,03,*
```

L A R P P RETRIEVAL TABULATION P A G E 36 OPERATION 01 091173

TIME	ID	TEMP	O3	CO	O3	CO
143535	20	73.98	.12	2.36		
143540	20	73.54	.10	2.25		
143546	20	74.23	.11	1.77		
143552	20	73.84	.14	2.42		
143558	20	73.51	.11	1.56		
143603	20	73.48	.10	1.74		
143609	20	73.45	.13	1.90		
143615	20	73.10	.07	1.64		
143621	20	72.59	.06	3.05		
143626	20	72.50	.07	2.06		
143632	20	-2.14	1.09	23.18		
143638	20	72.77	.04	1.88		
143644	20	72.44	.05	2.32		
143649	20	72.44	.06	2.29		
143655	20	72.51	.06	2.44		
143701	20	72.50	.06	2.92		
143707	20	73.14	.05	2.27		
143712	20	72.22	.05	2.55		
143718	20	72.89	.04	2.31		
143724	20	72.85	.03	2.69		
143730	20	72.41	.04	2.80		
143735	20	72.40	.03	2.21		
143741	20	72.14	.03	1.94		
143747	20	78.50	.07	-.59		
143753	20	72.00	.05	2.48		
143758	20	71.48	.04	2.21		
143804	20	71.55	.05	2.19		
143810	20	71.85	.04	2.17		
143816	20	72.10	.04	2.05		
143821	20	71.55	.04	2.62		
143827	20	71.85	.03	2.17		
143833	20	72.54	.04	1.68		
143838	20	71.51	.04	2.07		
143844	20	70.55	.03	2.52		
143850	20	70.40	.04	2.36		
143856	20	70.15	.04	2.80		
143901	20	69.85	.04	2.68		
143907	20	70.00	.07	2.96		
143913	20	34.85	.65	12.16		
143919	20	70.45	.04	2.55		
143924	20	70.50	.04	2.59		
143930	20	70.66	.04	2.62		
143936	20	70.50	.04	3.21		
143942	20	69.66	.04	3.26		
143947	20	69.84	.05	3.23		
143953	20	70.14	.05	2.56		
143959	20	70.00	.07	3.03		
144000						
144002						
144004	20	43.19	.55	10.31		
144010	20	69.54	.05	3.09		
144016	20	-23.91	1.36	28.65		
144022	20	68.49	.06	3.40		
144027	20	68.37	.05	3.19		
144033	20	68.19	.06	3.05		
144039	20	68.04	.06	3.15		
144045	20	67.90	.06	2.98		

Figure 3. Sample tabulations of selected fields for helicopter and van.

L A R P P RETRIEVAL TABULATION P A G E 1 OPERATION 01 091173

TIME	O3	CO
120829	.43	6.66
121207	.42	6.72
121426	.37	4.90
121552	.46	8.24
122005	.34	5.32
122045	.32	4.65
122336	.46	7.66
122405	.43	6.52
122651	.38	5.60
122845	.41	6.95
123119	.09	1.99
124002	.31	5.96
124450	.41	6.89
124541	.32	5.50
125001	.40	7.62
125137	.38	6.79
125313	.40	7.46
131044	.36	6.02
131123	.37	6.70
131323	.45	8.42
131334	.40	6.75
140315	.09	2.81
140827	.08	3.71
140845	.09	2.99
140948	.08	-1.89
141011	.08	3.19
141017	.08	3.30
141058	.08	3.16
141748	.08	3.21
142236	.08	3.88
142351	.08	3.35
142408	.08	3.32
142414	.10	3.78
142420	.09	3.86
142426	.08	3.41
142500	.08	3.17
142506	.10	3.59
142523	.09	2.93
142529	.08	2.86
142627	.10	2.98
142656	.08	3.71
142713	.09	3.54
143018	.08	2.76
143023	.08	3.75
143029	.08	3.15
143035	.09	3.25
143041	.11	3.30
143046	.12	3.81
143104	.11	3.53
143110	.11	3.43
143115	.11	3.45
143127	.12	3.21
143138	.10	3.37
143201	.08	2.65
143213	.08	2.42
143219	.09	2.61
143225	.11	2.13

Figure 4. Sample tabulation of ozone and CO data for helicopter.

In this case it is desired to plot the fields TIME, and O3 only for the helicopter record. The field TIME is plotted as the abscissa and O3 as the ordinate. Only the ordinate is scaled according to the SCALE specification. The TIME field is specified as an alphabetic parameter in the FIELD specification of Fig. 1. Accordingly, no symbol is specified for the time field, as indicated by the double comma which follows the word TIME in the PLOT specification. The data for O3 will be plotted using an asterisk (*) as the symbol. Fig. 5 shows the plot obtained by this specification.

2.2.4 Plots with Selection

A subset of the records in the data base may be selected for plotting by utilizing the SELECT features employed in previous examples. Further, selection can be extended to utilize the DEFINE feature described in Sec. 1.1.11. For example, assume that plots are only to be produced when the helicopter is flying a square pattern at a constant altitude and the ground vehicle (ARBVAN) is not moving. This may be implemented as shown:

```
{FILE,RECORD,FIELD DEFINITIONS}  - -  See Fig. 1
 SELECT,HELIO,ID,/30
 SELECT,,TIME,/
 SELECT,,TN,/0
 DEFINE,START,BEGIN
 SELECT,ARBVAN,MS,/0
 SELECT,,START,BEGIN
 SELECT,HELIO,ID,/30
```

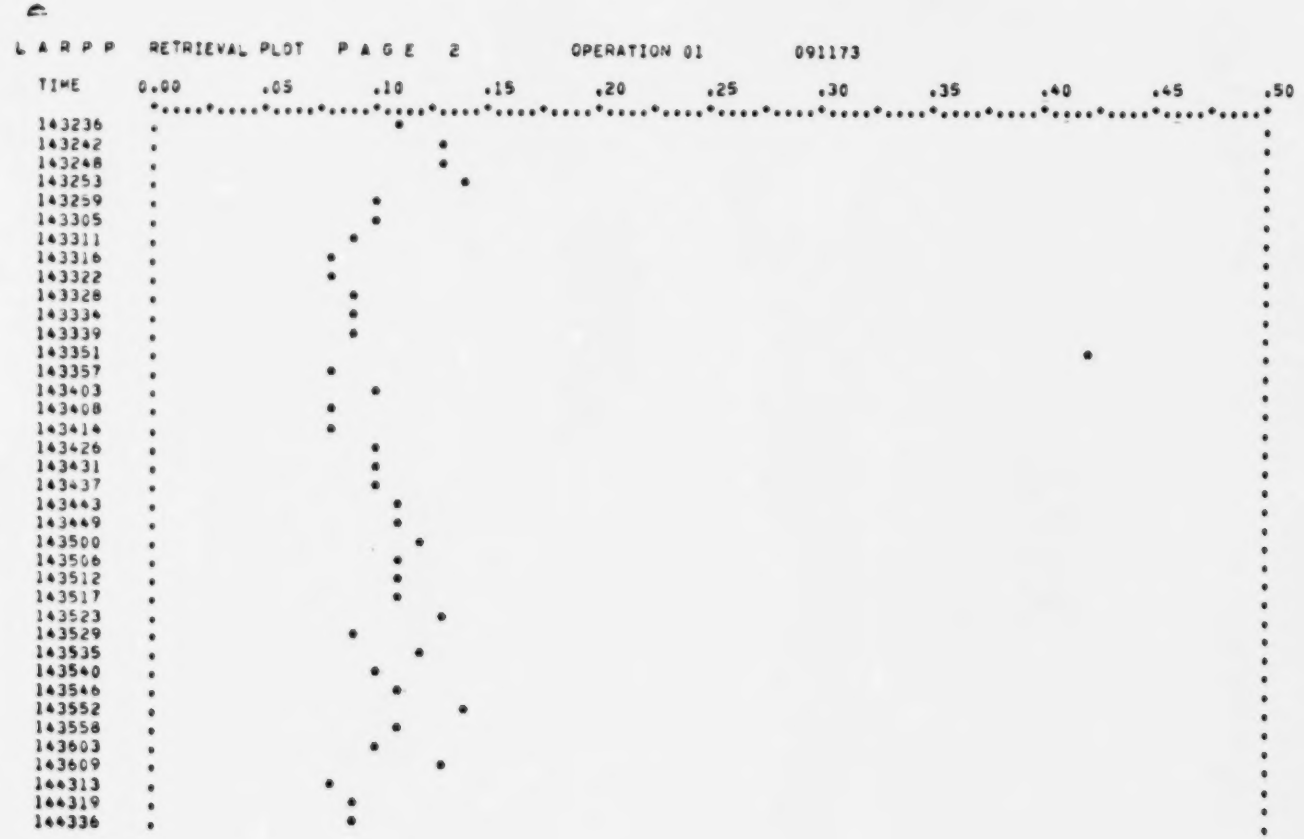

Figure 5. Sample plot of ozone data vs time for helicopter.

```
SELECT,,START,BEGIN
SCALE,0.0,20.0
PLOT,TIME
PLOT,HELIO,CO,C
PLOT,ARBVAN,CO,V
SELECT,HELIO,ID,/30
SELECT,,TN,/4
DEFINE,START,END
```

The second specification (SELECT,TIME,....) is provided to limit the period of interest to records for a certain time interval only for reduction of the amount of printed output produced. The third specification (SELECT,,TN,/0) is included for recognition of the start of a helicopter square pattern (turn=0). When these conditions are satisfied the field "START" is defined to contain the value "BEGIN." The second set of selects (statements 5 thru 8) declare that only helicopter records when START = BEGIN or van records when the van is stopped (MS = 0) and where START = BEGIN are to be selected for plotting.

2.2.5 Combining Multiple Specifications

The entire set of examples described in Secs. 2.2.1 through 2.2.3 were produced by collecting the individual sets of parameters together into a composite set as shown in Fig. 6 These were then input to the retrieval program to produce all of the outputs that accompany the referenced examples, with a single pass through the data base file.

```
OPERATION 01        091173
*************************************************************************
*     H E L I C O P T E R   R E C O R D   D E F I N I T I O N S         *
*************************************************************************
FILE,1,HCD,1510
RECORD,HELIO,25,1,/01,2
FORMAT(A2,A6,1X,A1,80X,A3,A1,A2,2A6,2A4,A2,F4,9F6,2,4F5,1)
FIELD,TYPE,01,2,A
FIELD,TIME,02,6,A
FIELD,TN,03,1,A
FIELD,JULD,04,3,A
FIELD,BT,05,1,A
FIELD,ID,06,2,A
FIELD,CHANV,07,6,A
FIELD,T     ,08,6,A
FIELD,TMXP ,09,4,A
FIELD,TMYP ,10,4,A
FIELD,BSAMP,11,2,A
FIELD,FRT  ,12,4,R
FIELD,NU    ,13,6,R
FIELD,NOX   ,14,6,R
FIELD,BRCT ,15,6,R
FIELD,CO    ,16,6,R
FIELD,TEMP ,17,6,R
FIELD,DEWPT,18,6,R
FIELD,NMHC ,19,6,R
FIELD,CH4  ,20,6,R
FIELD,O3    ,21,6,R
FIELD,X-POS,22,5,R
FIELD,Y-POS,23,5,R
FIELD,MSL  ,24,5,R
FIELD,AGL  ,25,5,R
*************************************************************************
*     A R B - V A N   R E C O R D   D E F I N I T I O N S               *
*************************************************************************
RECORD,ARBVAN,15,1,/02,2
FORMAT(A2,A6,82X,A6,7F6,2,I1,2F4,1,2F3)
FIELD,TYPE ,01,2,A
FIELD,TIME ,02,6,A
FIELD,T     ,03,6,A
FIELD,CH4  ,04,6,R
FIELD,O3    ,05,6,R
FIELD,NU    ,06,6,R
FIELD,NOX   ,07,6,R
FIELD,TOTHC,08,6,R
FIELD,CO    ,09,6,R
FIELD,FRT  ,10,6,R
FIELD,MS    ,11,1,I
FIELD,X-POS,12,4,R
FIELD,Y-POS,13,4,R
FIELD,TEMP ,14,3,R
FIELD,HUMID,15,3,R
*************************************************************************
*     THE FOLLOWING PARAMETERS REPRESENT THE RECORD SELECTION AND       *
*     TABULATION REQUESTS FOR THE CURRENT USER REQUIREMENT.             *
*************************************************************************
TABULATE,TIME,A6
TABULATE,HELIO,ID,A2,TEMP,F6,2,O3,F6,2
TABULATE,HELIO,CO,F6,2
TABULATE,ARBVAN,O3,F6,2,CO,F6,2
SELECT,HELIO,O3,0,08,0,50
TABULATE,TIME,A6,O3,F6,2,CO,F6,2
SCALE,0,0,0,50
PLOT,HELIO,TIME,,O3,*
**
```

Figure 6. Listing of input data for retrieval program.

3. IMPLEMENTATION OF RETRIEVAL PROGRAM

3.1 Current Implementation

The retrieval program has initially been implemented on the CDC 6400 computer system in the computer facility at the General Research Corporation. Certain unique features of this machine have been utilized by the program in optimizing the retrieval task. The most important of these are listed below:

1. 60-bit word length which permits up to ten alphabetic (Hollerith) characters to be contained in a single machine word.
2. Flexible document-oriented file structure which permits many input/output files to be concurrently active.
3. Availability of special character-string processing and bit manipulation routines from the computer system software library.
4. Special features of the CDC 6400 FORTRAN compiler, including ENCODE, DECODE, BUFFER IN, BUFFER OUT. These are described in the CDC FORTRAN Manual.*

Of these features, the one that will impact the most on alternative machine implementations are the word length and special routines mentioned in 1 and 3 above. The program takes substantial advantage of the large word-length in storage of alphabetic data. The special routines can be reprogrammed for another machine, but are not directly transferrable since they are coded in assembly language except for subroutine XMIT (described below). The routines used in this implementation are described in the following sections.

3.1.1 FUNCTION COMP (A,I,B,J,N)

This function compares two character strings and returns with a result of -1 (A is less than B); 0 (A is equal to B); +1 (A is greater

*Control Data CYBER 70 Computer Systems Models 72, 73, 74 6000 Computer Systems, FORTRAN Reference Manual, Version 2.3, Control Data Corporation, 1972, 10-15.

than B). Comparison begins with the Ith character of word-A and the Jth character of word-B and continues for N-characters (the leftmost character of a word is character number one). Comparison length is unlimited.

3.1.2 Subroutine MCHAR(I,A,J,B,N)

This subroutine moves "N" characters beginning with the Ith character of word-A to the destination beginning with the Jth character of word-B. The length of the character string is unlimited.

3.1.3 Function MSHIFT(A,I)

This function circularly shifts the word addressed by "A" the number of bit positions specified by "I." The direction of the shift (left or right) is determined by the sign of "I." If "I" is positive, the shift will be left-circular. If "I" is negative, the shift will be right-circular.

3.1.4 Subroutine XMIT(N,A,B)

This subroutine transmits "N" whole words from the source array "A" to the destination array "B." If "N" is negative, the source word "A" is replicated "N" times through array "B."

3.1.5 Function LENGTH(I)

This function returns the length of the last logical record which was read from unit I. The length is given in multiples of 10 characters rounded up to the highest multiple of 10.

3.2 Additional Machine Dependencies

The current implementation of the retrieval program requires the use of certain logical input/output units for proper internal operation as listed in Table 2.

TABLE 2 Logical unit numbers of input/output operations of retrieval program

Logical Unit Number (LUN)	USAGE
1	Magnetic Tape Input
5	Card Reader
6	Line Printer
7-16	Temporary Tabulation Files
17-26	Temporary Plot Files

The temporary files contain printer output for the various tabulations and plots as they are created during the retrieval process. At the conclusion of the retrieval operation, each of these is "copied" to the standard print file (LUN 6) to ease the operational headache of printing many separate files. The first tabulation is written to LUN-7; the second to LUN-8....etc., the first plot to LUN-17, the second to LUN-18, and so forth. Each of these is rewound and copied at the conclusion of the run, automatically. The user is cautioned not to use any of these units for his own purpose as no checking is done for conflicts of this sort. All other logical units (within the range acceptable to the compiler) are available to the user.

4. ARCHIVE DESCRIPTION

The LARPP second level archive is stored on magnetic tape as a collection of data records concatenated in strict time sequence. Several operations are stored on a single magnetic tape with a physical "file mark" defining the end of data for a given operation and a double "file mark" indicating the end of all data on the tape. The data for each operation on the tape is preceded by a label containing the operation number and date. The archive consists of several reels of magnetic tape and a detailed description of the contents and specifications of each reel is found in Appendix V.

4.1 Magnetic Tape Format*

In describing the tape format we must first distinguish between data records and data blocks. A data record contains measurements for one or more quantities for a unique time. For example, a helicopter data record contains pollutant concentrations of ozone, carbon monoxide, and other species as well as the helicopter position all for a specific time; a radiometer data record contains the sunlight intensity measured simultaneously at several stations at a particular time of day. Each type of data record has a fixed length, but, in general, the different types of data records have different lengths. To illustrate, the helicopter and radiometer data records have lengths of 196 and 134 characters, respectively.

Since the data records form a time series, it is apparent that the sequence will consist of a chain of data records of differing lengths.

---

*See Appendix IV for a description of the LIDAR data format.

In order to use the magnetic tape efficiently, the data records have been combined into blocks 5120 (six-bit) characters long. Thus, a data block is a collection of data records, the sum of whose lengths do not exceed 5120 characters. For ease of processing, there are no split data records between data blocks, i.e., a data record which would begin in block N and end in block N+1. Consequently, the data blocks are blank-filled whenever the need arises. The object is to maintain blocks of constant length without splitting data records; the price paid is some lost space on the tape. The data block, it should be apparent, is the physical record that is written on the tape.

Since the data records within a block have different lengths and their order is random, the length of each data record has been included as the first three characters of the record. The length thus given is the number of characters in multiples of 10 after rounding up to the next highest multiple of 10. Hence, for data records 191 to 200 characters long, the length shown on the tape would be 20. A record 201 characters long would show a length of 21. The retrieval program has been designed to read the data blocks and unravel each data record in the block.

Finally, it should be noted that the magnetic tapes are recorded in even parity (BCD) mode.

4.1.1 Label Records

Each physical file of information (each operation) is preceded by a label record which contains the operation number and date. The format of this record is given below; its recording mode is BCD (even parity) and is 30 characters in length:

Character	Description
1 - 9	Contains word OPERATION
10	Blank
11 - 12	Operation number (XX)
13 - 20	Blank
21 - 26	Date (MMDDYY)
27 - 30	Blank

The operation number consists of two characters, even though the number itself may consist of a single digit. Thus, for operation 1 the label contains the number 01.

To access a particular operation the user must input the operation number in columns 11-12 of the first card of the input data deck containing the file, record, field, and retrieval commands as shown in Fig. 6. The program will search the magnetic tape for the desired operation by matching the input number with the operation number on the tape itself. Diagnostic messages are printed if the operation is not found.

4.1.2 Character Set

The data records are recorded in BCD (even parity) mode, and the data itself is encoded in CDC 6000 internal display code. The translation of the six-bit patterns into their appropriate equivalent print characters is shown in Table 3. (Each "octal" bit pattern is listed along with its equivalent print character.)

4.2 Data Record Contents

The archive contains twenty-five types of data records, each being identified by a record name and a number. Table 4 lists the names, number and a brief description of the various record types. The actual contents of each record type are listed in Tables 5 - 27.

TABLE 3 CDC 6400 internal display character codes

CODE*	CHAR	CODE	CHAR	CODE	CHAR	CODE	CHAR
00	:(colon)	20	P	40	5	60	≡
01	A	21	Q	41	6	61	[
02	B	22	R	42	7	62	]
03	C	23	S	43	8	63	↑
04	D	24	T	44	9	64	≠
05	E	25	U	45	+	65	→
06	F	26	V	46	-	66	∨
07	G	27	W	47	*	67	∧
10	H	30	X	50	/	70	↑
11	I	31	Y	51	(	71	↓
12	J	32	Z	52	)	72	<
13	K	33	0	53	$	73	>
14	L	34	1	54	=	74	≤
15	M	35	2	55	blank	75	≥
16	N	36	3	56	,	76	¬
17	O	37	4	57	.	77	;

*All codes are in octal

TABLE 4 Record types in LARPP archive

Record Type No.	Record Name	Description
01	HELIO	Helicopter data (automatic)
02	ARBVAN	ARB van data (automatic)
03	HRADAR	Helicopter radar data
04	TETROON	Tetroon radar data
05	APCD	Aerometric data from Los Angeles Air Pollution Control District
06	GC1,GC2,GC3	Gas chromatographic data
07	BATTELLE	Aerometric data collected by Battelle Memorial Institute
08	ELMONTE	Aerometric data collected at El Monte
09		(Unused)
10	CTWINDS	Meteorological data collected by California Dept. of Transportation
11	MHELIO	Manual helicopter data
12	MARBVN	Manual ARB van data
13	TRAFFIC	Traffic counts
14	AIRPORT	Airport weather data
15	CHAMP	Aerometric data from Community Health Air Monitoring Program
16	TRHLA	Temperature and relative humidity from Los Angeles APCD
17	SOLAR	Radiometer data
18	EMSU	Soundings from EMSU
19	NITRATE	HNO_3 and PAN data
20	METDAT	Meteorological data from Los Angeles Air Pollution Control Dist.
21	ARBCTY	Aerometric data collected by ARB for surrounding counties
22	COBAGS	CO bag samples collected by California Department of Transportation
23	CTVAN	Aerometric data from California Dept. of Transportation van
24	RSONDE	Radiosonde data
25	WNDS1	Winds aloft at specified height levels
26	WNDS2	Winds aloft at constant pressure levels

TABLE 5 Helicopter record format

Character Position	Format	Description
1 - 2	A2	RECORD TYPE (01 or 11)
3 - 8	A6	LOCAL TIME (HHMMSS)
9	1X	(UNUSED)
10	A1	TURN NUMBER
11 - 90	(BINARY)	DATA QUALITY (1-bit per flag)*
91 - 93	A3	JULIAN DATE
94	A1	BAG SAMPLE TIME
95 - 96	A2	HELICOPTER ID (20,30)
97 - 102	A6	SELECTED CHANNEL VALUE
103 - 108	A6	TIME (HHMMSS)
109 - 112	A4	POSITION N-S (XXX.X)
113 - 116	A4	POSITION E-W (XXX.X)
117 - 118	A2	BAG SAMPLE NO.
119 - 122	I4	FLUOR. PART COUNT
123 - 128	F6.2	NO CONCENTRATION (PPM)
129 - 134	F6.2	NO_x CONCENTRATION (PPM)
135 - 140	F6.2	BSCT (VISIBILITY)
141 - 146	F6.2	CO CONCENTRATION (PPM)
147 - 152	F6.2	TEMP (^oF)
153 - 158	F6.2	DEWPT (^oF)
159 - 164	F6.2	NMHC CONCENTRATION (PPM)
165 - 170	F6.2	CH4 CONCENTRATION (PPM)
171 - 176	F6.2	O3 CONCENTRATION (PPM)
177 - 181	F5.1	X-POS (RADAR) (XXXX.X)
182 - 186	F5.1	Y-POS (RADAR) (XXXX.X)
187 - 191	F5.1	ALTITUDE MSL (XXXX.X FEET)
192 - 196	F5.1	ALTITUDE AGL (XXXX.X FEET)

*See Section 4.3.

TABLE 6 ARB van record format

Character Position	Format	Description
1 - 2	A2	RECORD TYPE (02 or 12)
3 - 8	A6	LOCAL TIME (HHMMSS)
9 - 10	2X	(UNUSED)
11 - 90	(BINARY)	DATA QUALITY FLAGS (1-bit per flag)*
91 - 96	A6	TIME (HHMMSS)
97 - 102	F6.2	CH4 CONCENTRATION (PPM)
103 - 108	F6.2	O3 CONCENTRATION (PPM)
109 - 114	F6.2	NO CONCENTRATION (PPM)
115 - 120	F6.2	NO_x CONCENTRATION (PPM)
121 - 126	F6.2	TOTHC CONCENTRATION (PPM)
127 - 132	F6.2	CO CONCENTRATION (PPM)
133 - 138	F6.2	FLUOR. PART. CT.
139	I1	VAN MOVING/STOPPED
140 - 143	F4.1	X-COORDINATE (XXXX.X)
144 - 147	F4.1	Y-COORDINATE (XXXX.X)
148 - 150	F3.0	DRY BULB TEMP. (^{o}F)
151 - 153	F3.0	WET BULB TEMP. (^{o}F)

*See Section 4.3.

TABLE 7 RADAR (helicopter positions) record format

Character Position	Format	Description
1 - 2	A2	RECORD TYPE (03)
3 - 8	A6	LOCAL TIME (HHMMSS)
9 - 10	2X	(UNUSED)
11 - 16	A6	CALENDAR DATE (MMDDYY)
17 - 22	A6	TIME (HHMMSS)
23	I1	HELICOPTER ID (1, 2, 3)
24 - 28	F5.1	Y-POSITION (XXXX.X km)
29 - 33	F5.1	X-POSITION (XXXX.X km)
34 - 38	F5.1	HELI. ALTITUDE (MSL) (XXXX.X FEET)
44 - 48	F5.1	TERRAIN HEIGHT (MSL) (XXXX.X FEET)

TABLE 8 Tetroon data format

Character Position	Format	Description
1-2	A2	RECORD TYPE (04)
3-8	A6	LOCAL TIME (HHMMSS)
9-10	2X	(UNUSED)
11-16	A6	DATE (MMDDYY)
17-23	A6	TIME (HHMMSS)
24-28	F5.1	X-COORDINATE (km)
29-33	F5.1	Y-COORDINATE (km)
34-38	F5.1	TETROON HEIGHT (ft MSL)
39-43	F5.1	TERRAIN HEIGHT (ft MSL)
44	I1	TETROON IDENTIFICATION NO.

TABLE 9 Los Angeles Air Pollution Control District data record format

Character Position	Format	Description
1-2	A2	RECORD TYPE (05)
3-8	A6	TIME (HHMMSS) PST
9-10	2X	(UNUSED)
11-13	I3	JULIAN DATE
14-16	I3	SITE (See Table 33)
17-19	I3	NMHC CONCENTRATION (PPM)
20-22	I3	03 CONCENTRATION (PPHM)
23-25	I3	CO CONCENTRATION (PPHM)
26-28	I3	SO2 CONCENTRATION (PPHM)
29-31	I3	NO2 CONCENTRATION (PPHM)
32-34	I3	NO CONCENTRATION (PPHM)
35-38	I3	NO_x CONCENTRATION (PPHM)
39-41	I3	CH4 CONCENTRATION (PPM)
42-44	I3	TEMPERATURE (^oF)
45-47	I3	HUMIDITY (%)
48-50	I3	SOLAR RADIATION ($GmCal/CM^2/HR$)
51-52	I2	WIND DIR. (1-16, 1=22.5° E of N)
53-54	I2	WIND SPEED (MPH)

TABLE 10 Gas chromatograph data record formats

Note: The following fields are common to all records, for all Data Code (pos.10) values.

Character Position	Format	Description	
1-2	A2	RECORD TYPE (06)	
3-8	A6	LOCAL TIME (HHMMSS)	
9	1X	(UNUSED)	
10	I1	DATA CODE	1 = first 15 values 2 = first 16 values 3 = full 51 values
11-13	I3	JULIAN DATE	
14	I1	VEHICLE	1 = ARB VAN 2 = Smog 2 (Helicopter) 3 = Smog 3 (Helicopter) 4 = El Monte Lab
15-16	I2	BAG SAMPLE NUMBER	
17-25	A9	LOCATION	for Smog 2 and 3 field contains: --XXXX--FT-- where, XXXX is altitude and the dashes denote blanks
26-29	F4.1	ETHANE	PPHM
30-33	F4.1	ETHYLENE	PPHM
34-37	F4.1	ACETYLENE	PPHM
38-41	F4.1	PROPANE	PPHM
42-45	F4.1	PROPYLENE	PPHM
46-49	F4.1	ISOBUTANE	PPHM
50-53	F4.1	N-BUTANE	PPHM
54-57	F4.1	1-BUTANE	PPHM
58-61	F4.1	ISOBUTYLENE+T2 BUTENE	PPHM
62-65	F4.1	ISO PENTANE	PPHM
66-69	F4.1	N-PENTANE	PPHM
70-73	F4.1	CYCLOPENTANE	PPHM

TABLE 10 (cont'd.)

Character Position	Format	Description	
74-77	F4.1	1-PENTENE	PPHM
78-81	F4.1	HEXANES	PPHM
82-85	F4.2	METHANE	PPM

Note: The following field occurs only when the Data Code (pos.10) is equal to 2.

Character Position	Format	Description	
86-89	F4.1	PROPADIENE	PPHM

Note: The remaining fields occur only when the Data Code (pos.10) is equal to 3.

Character Position	Format	Description	
86-89	F4.1	2,3,-DIMETHYLBUTANE	PPHM
90-93	F4.1	2- METHYLPENTANE	PPHM
94-97	F4.1	3-METHYLPENTANE	PPHM
98-101	F4.1	N-HEXANE	PPHM
102-105	F4.1	METHYLCYCLOPENTANE	PPHM
106-109	F4.1	2,4- DIMETHYLPENTANE	PPHM
110-113	F4.1	3,3- DIMETHYLPENTANE	PPHM
114-117	F4.1	2- METHYLHEXANE	PPHM
118-121	F4.1	2,3- DIMETHYLPENTANE	PPHM
122-125	F4.1	3- METHYLHEXANE	PPHM
126-129	F4.1	1 cis 3 DIMETHYLCYCLOPENTANE	PPHM
130-133	F4.1	1 trans 3 DIMETHYLCYCLOPENTANE	PPHM

TABLE 10 (cont'd.)

Character Position	Format	Description	
134-137	F4.1	3- ETHYL PENTANE	PPHM
138-141	F4.1	2,2,4- TRIMETHYLPENTANE	PPHM
142-145	F4.1	N- HEPTANE	PPHM
146-149	F4.1	1 cis 2 DIMETHYLCYCLOPENTANE	PPHM
150-153	F4.1	METHYLCYCLOHEXANE	PPHM
154-157	F4.1	2,5- DIMETHYLHEXANE	PPHM
158-161	F4.1	2,4- DIMETHYLHEXANE	PPHM
162-165	F4.1	1 2c 4- TRIMETHYLCYCLOPENTANE	PPHM
166-169	F4.1	TOLUENE	PPHM
170-173	F4.1	1 2c 3- TRIMETHYLCYCLOPENTANE	PPHM
174-177	F4.1	2,3,4- TRIMETHYLPENTANE	PPHM
178-181	F4.1	2,3,3- TRIMETHYLPENTANE	PPHM
182-185	F4.1	2,3- DIMETHYLHEXANE	PPHM
186-189	F4.1	2- METHYLHEPTANE	PPHM
190-193	F4.1	3- METHYLHEPTANE	PPHM
194-197	F4.1	2,2,5- TRIMETHYLHEXANE	PPHM
198-201	F4.1	1,1- DIMETHYLCYCLOHEXANE	PPHM
202-205	F4.1	1 2- DIMETHYLCYCLOHEXANE	PPHM
206-209	F4.1	N- OCTANE	PPHM
210-213	F4.1	ETHYLBENZENE	PPHM
214-217	F4.1	P- XYLENE	PPHM
218-221	F4.1	M- XYLENE	PPHM
222-225	F4.1	O- XYLENE	PPHM
226-229	F4.1	N- NONANE	PPHM

TABLE 11 Battelle data record format

Character Position	Format	Description
1-2	A2	RECORD TYPE (07)
3-8	A6	LOCAL TIME (HHMMSS)
9-10	2X	(UNUSED)
11-16	F6.3	SOLAR IRRADIANCE ($Cal/Cm^2/min$)
17-22	F6.3	WIND SPEED (MPH)
23-28	F6.3	WIND DIRECTION (DEGREES)
29-34	F6.3	TEMPERATURE (^oC)
35-40	F6.3	RELATIVE HUMIDITY (%)
41-46	F6.3	LIGHT SCATTERING ($10^{-4}/mi$)
47-52	F6.3	SO2 (PPM)
53-58	F6.3	O3 (PPM)
59-64	F6.3	NO (PPM)
65-70	F6.3	NO2 (PPM)
71-76	F6.3	NO_x (PPM)
77-82	F6.3	NH3 (PPM)

TABLE 12 El Monte Lab trailer data record format

Character Position	Format	Description
1-2	A2	RECORD TYPE (08)
3-8	A6	LOCAL TIME (HHMMSS)
9-10	2X	(UNUSED)
11-16	A6	DATE (MMDDYY)
17-20	F4.2	OXIDANTS (PPM)
21-24	F4.2	NO (PPM)
25-28	F4.2	NO2 (PPM)
29-32	F4.1	SO2 (PPM)
33-36	F4.1	CO (PPM)
37-40	F4.1	HC - TOTAL (PPM)
41-44	F4.1	BSCT ($x10^{-4}$ Mi^{-1})
45-48	F4.2	NEPHELOMETER (MILES)
49-52	F4.0	RELATIVE HUMIDITY (%)
53-56	F4.1	TEMPERATURE (^{o}F)
57-60	F4.0	WIND SPEED (MPH)
61-64	F4.0	WIND DIRECTION (DEGREES)

TABLE 13 Record format for surface wind vector and temperature at California Department of Transportation stations

Character Position	Format	Description
1-2	A2	RECORD TYPE (10)
3-8	A6	TIME (HHMMSS) PST
9-14	A6	DATE (MMDDYY)
15	A1	SITE CODE (See Table 33 for site code data)
* 16-18	I3	WIND DIRECTION (DEG)
19-20	I2	WIND SPEED (MPH)
21-22	I2	TEMPERATURE (°F)
.	.	.
.	.	.
.	.	.
71	A1	SITE CODE
72-74	I3	WIND DIRECTION (DEG)
75-76	I2	WIND SPEED (MPH)
77-78	I2	TEMPERATURE (°F)

*This data set is repeated 8 times, one data set for each of eight stations.

TABLE 14 Traffic counts record format

Character Position	Format	Description
1-2	A2	RECORD TYPE (13)
3-8	A6	TIME (HHMMSS) PST
9-14	A6	DATE (MMDDYY)
15	A1	SITE CODE (See Table 34 for site code data)
16	A1	DIRECTION OF TRAFFIC (N,S,E,W)
* 17-20	I4	HOURLY TRAFFIC COUNT
21	A1	DIRECTION OF TRAFFIC (S,N,W,E)
22-25	I4	HOURLY TRAFFIC COUNT
.	.	.
.	.	.
.	.	.
81	A1	SITE CODE
82	A1	DIRECTION OF TRAFFIC (N,S,E,W)
83-86	I4	HOURLY TRAFFIC COUNT
87	A1	DIRECTION OF TRAFFIC (S,N,W,E)
88-91	I4	HOURLY TRAFFIC COUNT

*This data set is repeated 7 times, one data set for each of seven sites.

TABLE 15 Record format for airport hourly observations

Character Position	Format	Description
1-2	A2	RECORD TYPE (14)
3-8	A6	LOCAL TIME (HHMMSS)
9-14	A6	DATE (MMDDYY)
15-17	A3	SITE CODE (See Table 35 for site code data)
18	I1	CLOUD COVER CODE-LOW CEILING (See Table 36)
19-23	I5	LOW CEILING (FEET ABOVE GROUND)
24	I1	CLOUD COVER CODE-HIGH CEILING (See Table 36)
25-29	I5	HIGH CEILING (FEET ABOVE GROUND)
30-32	F3.1	VISIBILITY (MILES)
33-34	I2	VISIBILITY OBSTRUCTION CODE (See Table 37)
35-39	F5.1	SEA LEVEL PRESSURE (MB)
40-43	F4.2	SEA LEVEL PRESSURE (IN. Hg)
44-45	I2	TEMPERATURE (^{O}F)
46-47	I2	DEW POINT (^{O}F)
48-50	I3	WIND DIRECTION (DEGREES)
51-54	F4.1	WIND SPEED (MPH)

TABLE 16 Record format for CHAMP Data

Character Position	Format	Description
1-2	A2	RECORD TYPE (15)
3-8	A6	TIME (HHMMSS) PST
9-14	A6	DATE (MMDDYY)
* 15-18	I4	SITE CODE (See Table 38)
* 19-20	I2	POLLUTANT CODE (See Table 39)
* 21-22	I2	MEASUREMENT METHOD CODE (See Table 40)
* 23-29	F7.1	POLLUTANT CONCENTRATION
.	.	.
.	.	.
.	.	.
.	.	.
630-633	I4	SITE CODE
634-635	I2	POLLUTANT CODE
636-637	I2	MEASUREMENT METHOD
638-644	F7.1	POLLUTANT CONCENTRATION

*Note: The indicated data set is repeated 42 times, one data set for each of 7 sites and 6 pollutants.

TABLE 17 Record format for temperature and humidity data from Los Angeles Air Pollution Control District

Character Position	Format	Description
1-2	A2	RECORD TYPE (16)
3-8	A6	TIME (HHMMSS) PST
9-14	A6	DATE (MMDDYY)
15-18	A4	SITE CODE*
19-20	I2	TEMPERATURE (^{o}F)
21-22	I2	RELATIVE HUMIDITY (%)
23-26	A4	SITE CODE*
27-28	I2	TEMPERATURE (^{o}F)
29-30	I2	RELATIVE HUMIDITY (%)
31-34	A4	SITE CODE*
35-36	I2	TEMPERATURE (^{o}F)
37-38	I2	RELATIVE HUMIDITY (%)
39-42	A4	SITE CODE*
43-44	I2	TEMPERATURE (^{o}F)
45-46	I2	RELATIVE HUMIDITY (%)
47-50	A4	SITE CODE*
51-52	I2	TEMPERATURE (^{o}F)
53-54	I2	RELATIVE HUMIDITY (%)
55-58	A4	SITE CODE*
59-60	I2	TEMPERATURE (^{o}F)
61-62	I2	RELATIVE HUMIDITY (%)

*See Table 41 for site codes.

TABLE 18 Radiometer data record format

Character Position	Format	Description
1-2	A2	RECORD TYPE (17)
3-8	A6	LOCAL TIME (HHMMSS)
9-14	A6	DATE (MMDDYY)
* 15-16	A2	SITE CODE (See Table 42 for site code data)
* 17-19	F3.1	RADIATION INTENSITY (WATTS/M^2)
.	.	.
.	.	.
.	.	.
130-131	A2	SITE CODE
132-134	F3.1	RADIATION INTENSITY (WATTS/M^2)

*The indicated data set is repeated 24 times, one data set for each of 24 sites.

TABLE 19 EMSU sounding data record format

Character Position	Format	Description
1-2	A2	RECORD TYPE (18)
3-8	A6	LOCAL TIME (HHMMSS)
9-14	A6	DATE (MMDDYY)
15-16	A2	SITE CODE*
17-20	I4	HEIGHT (METERS ABOVE GROUND)
21-24	I4	PRESSURE (MB)
25-27	F3.1	TEMPERATURE (^{o}C)
28-30	I3	RELATIVE HUMIDITY (%)
31-34	I4	HEIGHT (METERS ABOVE GROUND)
35-38	I4	PRESSURE (MB)
39-41	F3.1	TEMPERATURE (^{o}C)
42-44	I3	RELATIVE HUMIDITY (%)
45-48	I4	HEIGHT (METERS ABOVE GROUND)
49-52	I4	PRESSURE (MB)
53-55	F3.1	TEMPERATURE (^{o}C)
56-58	I3	RELATIVE HUMIDITY (%)
59-62	I4	HEIGHT (METERS ABOVE GROUND)
63-66	I4	PRESSURE (MB)
67-69	F3.1	TEMPERATURE (^{o}C)
70-72	I3	RELATIVE HUMIDITY (%)

*Site codes are: 01 - Alameda and 7th St.; 02 - Los Amigos Hospital;
03 - Old Schoolhouse Rd. and Imperial Blvd., Downey;
04 - Cherry St., Long Beach.

TABLE 20 Battelle Fate of NO_x data record format

Character Position	Format	Description
1-2	A2	RECORD TYPE (19)
3-8	A6	LOCAL TIME (HHMMS)
9-14	A6	DATE (MMDDYY)
15-16	2X	(UNUSED)
17-21	I5	PAN (PPB)
22-26	I5	HNO_3 (PPB)

TABLE 21 Record format for meteorological data from Los Angeles Air Pollution Control District

Character Position	Format	Description
1-2	A2	RECORD TYPE (20)
3-8	A6	TIME (HHMMSS) PST
9-14	A6	DATE (MMDDYY)
* 15-18	A4	SITE CODE (See Table 41)
* 19-20	I2	WIND DIRECTION (16-point compass)
* 21-22	I2	WIND SPEED (MPH)
.	.	.
.	.	.
.	.	.
279-282	A4	SITE CODE
283-284	I2	WIND DIRECTION (16-point compass)
285-286	I2	WIND SPEED (MPH)

*Note: The indicated group of data is repeated 34 times, one set of data for each of 34 stations.

TABLE 22 Record format for ARB data for counties outside Los Angeles

Character Position	Format	Description
1-2	A2	RECORD TYPE (21)
3-8	A6	TIME (HHMMSS) PST
9-14	A6	DATE (MMDDYY)
* 15-16	I2	COUNTY CODE (See Table 43)
* 17-19	I3	STATION CODE (See Table 43)
* 20-21	I2	POLLUTANT CODE (See Table 44)
* 22-24	I3	HOURLY AVERAGE CONCENTRATION
.	.	.
.	.	.
.	.	.
1295-1296	I2	COUNTY CODE
1297-1299	I3	STATION CODE
1300-1301	I2	POLLUTANT CODE
1302-1304	I3	HOURLY AVERAGE CONCENTRATION

*Note: The indicated set of data is repeated 129 times, one set of data for each active county station and 8 different pollutants.

TABLE 23 Record format for CO bag samples from California Department of Transportation

Character Position	Format	Description
1-2	A2	RECORD TYPE (22)
3-8	A6	TIME (HHMMSS) PST
9-14	A6	DATE (MMDDYY)
15-16	A2	SITE CODE (See Table 45 for site code data)
17-18	I2	CO (PPM)

TABLE 24 Record format for van data from California Department of Transportation

Character Position	Format	Description
1-2	A2	RECORD TYPE (23)
3-8	A6	TIME (HHMMSS) PST
9-14	A6	DATE (MMDDYY)
15-16	A2	SITE CODE (See Table 46 for site code data)
17-18	F2.1	WIND SPEED (MPH)
19-21	I3	WIND DIRECTION (DEG)
22-23	I2	CO (PPM)
24-26	F3.1	OZONE (PPHM)
27-29	F3.1	NO (PPHM)
30-32	F3.1	NO_2 (PPHM)
33-35	F3.1	NO_x (PPHM)

TABLE 25 Record format for radiosonde sounding data

Character Position	Format	Description
1-2	A2	RECORD TYPE (24)
3-8	A6	TIME (HHMMSS) PST
9-14	A6	DATE (MMDDYY)
15-16	A2	SITE CODE*
17-20	I4	PRESSURE (MB)
21-23	F3.1	TEMPERATURE (^{O}C)
24-28	F5.1	DEWPT (^{O}C)
29-32	I4	HEIGHT (METERS ABOVE GROUND)
33-36	I4	PRESSURE (MB)
37-39	F3.1	TEMPERATURE (^{O}C)
40-44	F5.1	DEWPT (^{O}C)
45-48	I4	HEIGHT (METERS ABOVE GROUND)
49-52	I4	PRESSURE (MB)
53-55	F3.1	TEMPERATURE (^{O}C)
56-60	F5.1	DEWPT (^{O}C)
61-64	I4	HEIGHT (METERS ABOVE GROUND)
65-68	I4	PRESSURE (MB)
69-71	F3.1	TEMPERATURE (^{O}C)
72-76	F5.1	DEWPOINT (^{O}C)
77-80	I4	HEIGHT (METERS ABOVE GROUND)

*Site codes are: 01 - Los Angeles International Airport; 02 - El Monte.

TABLE 26 Record format for winds aloft - significant levels

Character Position	Format	Description
1-2	A2	RECORD TYPE (25)
3-8	A6	LOCAL TIME (HHMMSS)
9-14	A6	DATE (MMDDYY)
15-19	A5	SITE CODE*
20-23	A4	DATE AT GREENWICH (MMDD)
24-25	A2	GREENWICH MEAN TIME (HOURS)
26-29	F4.1	TEMPERATURE (^{o}C)
30-32	I3	RELATIVE HUMIDITY (%)
33-37	I5	HEIGHT (GEOPOTENTIAL METERS ABOVE MSL)
38-42	F5.1	PRESSURE (MB)
43-45	I3	WIND DIRECTION (DEGREES)
46-48	I3	WIND SPEED (METERS/SECOND)

*Two sites were used: Los Angeles International Airport and El Monte. The site codes are LSANG and ELMNT, respectively.

TABLE 27 Record format winds aloft - constant pressure levels

Character Position	Format	Description
1-2	A2	RECORD TYPE (26)
3-8	A6	LOCAL TIME (HHMMSS)
9-14	A6	DATE (MMDDYY)
15-19	A5	SITE CODE*
20-23	A4	DATE AT GREENWICH (MMDD)
24-25	A2	GREENWICH MEAN TIME (HRS)
26-29	I4	PRESSURE (MB)
30-33	I4	HEIGHT (GEOPOTENTIAL METERS ABOVE MEAN SEA LEVEL)**
34-37	F4.1	TEMPERATURE (^{o}C)
38-39	I2	RELATIVE HUMIDITY (%)
40-42	I3	WIND DIRECTION (DEG)
43-44	I2	WIND SPEED (METERS/SEC)
45-48	I4	PRESSURE (MB)
49-52	I4	HEIGHT (METERS)
53-56	F4.1	TEMPERATURE (^{o}C)
57-58	I2	RELATIVE HUMIDITY (%)
59-61	I3	WIND DIRECTION (DEG)
62-63	I2	WIND SPEED (METERS/SEC)
64-67	I4	PRESSURE (MB)
68-71	I4	HEIGHT (METERS)
72-75	F4.1	TEMPERATURE (^{o}C)
76-77	I2	RELATIVE HUMIDITY (%)
78-80	I3	WIND DIRECTION (DEG)
81-82	I2	WIND SPEED (METERS/SEC)
83-86	I4	PRESSURE (MB)
87-90	I4	HEIGHT (METERS)
91-93	F4.1	TEMPERATURE (^{o}C)
94-95	I2	RELATIVE HUMIDITY (%)
96-98	I3	WIND DIRECTION (DEG)
99-100	I2	WIND SPEED (METERS/SEC)

*Site codes are LSANG and ELMNT for Los Angeles International Airport and El Monte, respectively.

**Zero height indicates ground level whose elevation is not known.

TABLE 27 (cont'd.)

Character Position	Format	Description
101-104	I4	PRESSURE (MB)
105-108	I4	HEIGHT (METERS)
109-112	F4.1	TEMPERATURE (^{o}C)
113-114	I2	RELATIVE HUMIDITY (%)
115-117	I3	WIND DIRECTION (DEG)
118-119	I2	WIND SPEED (METERS/SEC)
120-123	I4	PRESSURE (MB)
124-127	I4	HEIGHT (METERS)
128-131	F4.1	TEMPERATURE (^{o}C)
132-133	I2	RELATIVE HUMIDITY (%)
134-136	I3	WIND DIRECTION (DEG)
137-138	I2	WIND SPEED (METERS/SEC)
139-142	I4	PRESSURE (MB)
143-146	I4	HEIGHT (METERS)
147-150	F4.1	TEMPERATURE (^{o}C)
151-152	I2	RELATIVE HUMIDITY (%)
153-155	I3	WIND DIRECTION (DEG)
156-157	I2	WIND SPEED (METERS/SEC)
158-161	I4	PRESSURE (MB)
162-165	I4	HEIGHT (METERS)
166-169	F4.1	TEMPERATURE (^{o}C)
170-171	I2	RELATIVE HUMIDITY (%)
172-174	I3	WIND DIRECTION (DEG)
175-176	I2	WIND SPEED (METERS/SEC)

4.3 Data Quality Flags

Both the helicopter and ARB van data (Tables 5 and 6) contain a set of flags that describe the conditions under which the data were taken. In general, the flags identify situations which may have adversely affected the quality of the data. Unflagged data can thus generally be considered to be unaffected by anomalous instrumental or environmental conditions. Thus, the flags act as an experimental log of comments.

The flags which exist on the archive files are described in Tables 28 and 29 for the helicopter and van, respectively. Note that certain flags apply to individual instruments (denoted by an asterisk by the flag number) while others are global and apply to all instruments simultaneously (unmarked flags). Each flag is assigned a single bit-position in the flag field. The correspondence between the flag numbers shown in Tables 28 and 29 and the bit-positions in the data record are shown in Tables 30 and 31.

TABLE 28 List of helicopter data flags[†]

Flag Number	Description
1*	Instrument outage
2*	Instrument output noisy
3*	Instrument scale setting disagrees with thumbwheels
5.	Ozone analyzer has ozone loss due to stainless steel components
6.	Ozone analyzer has light leak problems
7.	Nitric oxide analyzer (3,5) has possible light leak problems
8.	Nitric oxide analyzer (2,5) has possible light leak problems
9.	Converter efficiency of $NO_2 \rightarrow NO$ is erratic
10.	Hydrocarbon analyzer calibrated through calibration port instead of sample port

[†]Flags marked by asterisks (*) apply to individual instruments. Unmarked flags apply to all instruments simultaneously or to the one specific instrument designated in the flag description.

TABLE 28[+] (cont'd.)

Flag Number	Description
11.	Hydrocarbon analyzer has slow time response due to flow interferences
12*	No preflight span setting
13*	No preflight zero setting
14*	No span setting hands-off postflight check
15*	No zero setting postflight check
16.	No altitude correction applied
17.	Approximate altitude correction applied
18.	Radar altitude correction applied
19.	Ozone analyzer span correction is suspect because of possible temperature interferences with ozone generator operation
21.	Nitrogen carrier gas used to calibrate hydrocarbon analyzer (0.604 correction applied)
22.	Methane and propane were in separate tanks and hydrocarbon analyzer span gas had to be mixed
24.	Flight pattern not well centered on tetroon centroid
25.	Flight pattern distorted
26.	Altitude deviation noted in flight pattern
27*	Cross correlation between instrument log and magnetic tape recorded values is poor
28.	Ethylene exhausted outboard first time (SMOG 2) date Sept. 20 operation 1 to 6 flag as ethylene in cabin
29.	Ethylene exhaust outboard SMOG 3 date Sept. 26 Operation 1 to 8 flag as ethylene in cabin
30.	Bag handling procedure improved Sept. 17th. Test affected under old procedures 1 through 4
31.	Flag all FPT data as not edited
32*	Pots changed during flight. Data suspect (zero drift)
33*	Questionable calibration technique
34*	Instrument turned off during calibration
35*	Instrument turned off during operation

[+]Flags marked by asterisks (*) apply to individual instruments. Unmarked flags apply to all instruments simultaneously or to the one specific instrument designated in the flag description.

TABLE 28† (cont'd.)

Flag Number	Description
36*	Instrument would not zero during preflight calibration
37*	Instrument would not zero on postflight calibration
38.	Dew point and temperature resistive network not yet installed for calibration
39.	Ozone instrument calibrated from graph of ozone generator output and data is corrected for temperature
40.	Ozone instrument calibrated from DASIBI instrument
42*	Cable problems
43*	No ENROUTE zero air test
44*	Response time effects data from next constant level altitude due to enroute zero air test
45*	Short zero air time period
47*	Meter movement sticky
48*	Power failure or faulty power tranfer at takeoff
50*	No in-flight zero air test
51*	Zero air values are higher than normal
52*	No airborne zero (any type)
54.	Etheylene could not be adjusted
55*	No return to base (RTB) zero air test
57.	Black plastic installed at TECOS
58.	No higher than NO_x
59.	Cal data identify
113*	Poor calibration data
115*	Instrument was not calibrated
116*	Spurious signal
118*	Meter readings are inadequate. Span drift used ML1 (voltmeter) to compute drift
119.	Calibration gas changed between operations
120.	CO in zero air was used to dilute the span gage. Affects the scale by approximately 20% (low)
123*	Scale factor computed using postflight zero values obtained from the post flight calibration data for that operation

†Flags marked by asterisks (*) apply to individual instruments. Unmarked flags apply to all instruments simultaneously or to the one specific instrument designated in the flag description.

TABLE 28[†] (cont'd.)

Flag Number	Description
147.	Non-ARB gas analysis used for span value, correction factor needed
148*	Scale change due to span pot not being able to adjust instrument to calibration source
151.	Correction temperature was 400°C. Should be 430°C
165.	03 instrument was calibrated from graph, no temperature correction is possible
168.	Instrument was zeroed with zero air and without Bendix calibration unit
169.	Soap bubble contamination occurred during post flight calibration
177.	Nucleopore filter installed
178*	Clogged plumbing

[†]Flags marked by asterisks (*) apply to individual instruments. Unmarked flags apply to all instruments simultaneously or to the one specific instrument designated in the flag description.

TABLE 29 List of van data flags[†]

Flag Number	Description
1*	Instrument outage
2*	Instrument output noisy
4*	Cross correlation between instrument log and magnetic tape recorded values is poor
5.	Data scanning rate has been decreased
6.	Total hydrocarbon only is being measured
7.	Total hydrocarbon and methane are being measured
8.	Methane only measured
9.	Time phase lag exists in NO and NO_x channels
10*	Zero reset is unavailable
11*	Span calibration is unavailable
12*	Large span drift correction is being applied - interpolated linearly in time
13*	The van is moving
14.	The helicopters are now in a flight pattern correlated with van location
15*	Unedited data - No cross check made between magnetic tape recorded data and strip charts or logs
16.	NO higher than NO_x
17.	NO_x switch to NO and back to NO_x
18.	HC readings questionable due to low pressure

[†]Flags marked by asterisks (*) apply to individual instruments. Unmarked flags apply to all instruments simultaneously or to the one specific instrument designated in the flag description.

TABLE 30 Equivalences between flag numbers and bit-positions for helicopter data

Flag	Nominal Bit-Position	Quantity of Instrument Channels	Flag	Nominal Bit-Position	Quantity of Instrument Channels
1	0	9	37	137	9
2	9	9	38	146	9
3	18	9	39	155	1
5	27	1	40	156	1
6	28	1	42	157	9
7	29	1	43	166	9
8	30	1	44	175	9
9	31	1	45	184	9
10	32	1	47	193	9
11	33	1	48	202	9
12	34	9	50	211	9
13	43	9	51	220	9
14	52	9	52	229	9
15	61	9	54	238	1
16	70	1	55	239	9
17	71	1	57	248	1
18	72	1	58	249	1
19	73	1	59	250	1
21	74	1	113	251	9
22	75	1	115	260	9
24	76	1	116	269	9
25	77	1	118	278	9
26	78	1	119	287	1
27	79	9	120	288	1
28	88	1	123	289	9
29	89	1	147	298	1
30	90	1	148	299	9
31	91	1	151	308	1
32	92	9	165	309	1
33	101	9	168	310	1
34	110	9	169	311	1
35	119	9	177	312	1
36	128	9	178	313	9

Channel Number	Channel Name	Channel Number	Channel Name
0	NO	5	DEW PT.
1	NO_x	6	NMHC
2	BSCT	7	CH4
3	CO	8	O_3
4	TEMP		

TABLE 31 Equivalences between flag numbers and bit-positions for ARB van data

Flag	Nominal Bit-Position	Quantity of Instrument Channels	Flag	Nominal Bit-Position	Quantity of Instrument Channels
1	0	7	12	39	7
2	7	7	13	46	1
4	14	7	14	47	1
6	21	1	15	48	7
7	22	1	16	55	1
8	23	1	17	56	1
9	24	1	18	57	1
10	25	7	19	58	1
11	32	7			

Channel Number	Channel Name
0	CH19*
1	O_3
2	NO
3	NO_x
4	Tot. HC
5	CO
6	Fluor. Part. Ct.

*This channel was used to indicate when the Total Hydrocarbon channel is reading methane (non-zero) or total hydrocarbons (zero).

From Tables 30 and 31 it can be seen that several flags apply to more than one instrument channel. For example, flag number 1 in Table 30 applies to all 9 instrument channels on an individual basis. These are the flags which are marked by asterisks in Tables 28 and 29. The unmarked flags in these same tables apply to all instrument channels simultaneously and thus have only a single bit assigned to them as shown in Tables 30 and 31.

Since some flags apply to more than one instrument channel, it is necessary to be able to convert from flag number to the bit-position which corresponds to a given instrument channel. The conversion algorithm is illustrated by the following example.

Example 1: Find the bit-position corresponding to flag number 12 for the CO channel for the helicopter.

Step 1. Consult Table 30 and find that flag number 12 corresponds to nominal bit-position 34.

Step 2. From Table 30 it can be seen that the CO channel number is 3.

Step 3. Add the channel number to the nominal bit-position to compute the actual bit-position, i.e., 3 + 34 = 37.

The conversion from the bit-position to the flag number is illustrated in Example 2 below.

Example 2: Find the flag number corresponding to bit-position 150 in the helicopter record and identify the instrument channel being flagged.

Step 1. In Table 30 find the nominal bit-position whose number is less than or equal to 150. In this case we find 146 < 150.

Step 2. The flag number is that corresponding to nominal bit-position 146, i.e., 38.

Step 3. The instrument channel number is given by the difference between the bit-position and the nominal bit-position, i.e., 150 - 146 = 4, the temperature channel.

4.3.1 Accessing Data Flags

The user can access data flags by using the COMPUTE option (see Section 1.1.10) and a logical function subprogram supplied with the retrieval package. The subprogram is called FLAG and is used as follows.

FLAG(I,A)

where I is the flag number from Tables 28 and 29 and A is an alphabetic (Hollerith) variable which must consist of one of the following mnemonics and corresponds to the instrument channel.

A	Description of Instrument Channel
NO	Nitric Oxide
NO_X	Nitrogen Oxides
BSCT	Light Scattering
CO	Carbon Monoxide
TEMP	Temperature
DEWPT	Dew Point
NMHC	Nonmethane Hydrocarbons (helicopter only)
CH4	Methane
O3	Ozone
TOTHC	Total hydrocarbons (van only)

The function FLAG is a logical function which returns a "true" or "false" value depending on whether the flag is present (true) or absent (false). For example, if one wanted to check whether flag number 27

for the NO channel is present one can use FLAG as follows:

```
IF(FLAG(27,2HNO))  GO TO - - -.
```

If flag 27 is present in the NO channel, the function will return a "true" value and the GO TO statement will be executed. The GO TO statement will not be executed if the flag is absent and the function returns a "false" value.

4.4 Definition of Code Numbers Used in Data Records

Several of the data records contained in the LARPP archive use numerical codes to designate the sites where the data were collected and to describe certain classes of observations. The codes used in each data record affected are tabulated and defined in Tables 32 - 46. Each table has been cross-referenced to its corresponding data record.

TABLE 32 Station codes for Los Angeles Air Pollution Control District air quality data*

Code	Location
1	434 S. San Pedro Street, LA
13	1657 Geamercy Avenue, Torrance
21	Long Beach
41	Burbank
60	803 Loren Avenue, Azusa
61	844 S. La Brea, West LA
69	228 W. Palm Avenue, Burbank
71	2351 Westwood Boulevard, West LA
72	3648 Long Beach Boulevard, N. Long Beach
73	Hollywood Frwy., 608 N. Heliotscope Dr., LA
74	18330 Gault St., Reseda
75	924 N. Garey Avenue, Pomona
76	11408 La Cienega Boulevard, LA
80	14427 Leffingwell Road, Whittier
81	24811 San Fernando Road, Newhall
82	45547 N. Beach Street, Lancaster
83	Pasadena
84	Downey
89	Palmdale Airport
299	Mobile Station

*Corresponds to Table 9.

TABLE 33 Site codes for California Department of Transportation Wind Data*

Code	Coordinate	
	X	Y
01 Freeway	-8.3	86.4
02 Freeway	85.8	14.2
03 Freeway	58.1	14.0
04 Surface	51.3	14.1
05 Freeway	86.0	0.9
06 Surface	86.7	9.1
07 Freeway	86.7	-1.3
08 Freeway	19.2	41.0

*See Table 13.

TABLE 34 Site codes for traffic count data*

Code	Coordinate	
	X	Y
1 Freeway	30.7	19.4
2 Freeway	22.4	73.3
3 Freeway	36.5	49.3
4 Surface	7.0	51.3
5 Surface	84.6	-9.1
6 Freeway	45.4	61.6
7 Freeway	68.7	57.9

*See Table 14.

TABLE 35 Site codes for airport data*

Site Code	Location
BUR	Burbank
ELM	El Monte
LAX	Los Angeles International Airport
LGB	Long Beach Airport
ONT	Ontario Airport
RIV	Riverside (March AFB)
SBD	San Bernardino (Norton AFB)

*Corresponds to Table 15.

TABLE 36 Cloud cover codes for airport data*

Code	Sky Cover	Definition
1	Clear	Less than 0.1 sky cover
2	Scattered	0.1 to less than 0.6 sky cover
3	Broken	0.6 to 0.9 sky cover
4	Overcast	More than 0.9 sky cover
5	Thin Obscuration	0.1 to less than 1.0 sky hidden by an obstruction to vision
6	Obscured	1.0 sky hidden by an obstruction to vision
7	Indefinite	The vertical visibility upward to a surface-based obscuring phenomenon

*Corresponds to Table 15.

TABLE 37 Obstruction to vision codes for airport data*

Code	Obstruction to Vision
1	Haze
2	Smoke
3	Fog
4	Rain
5	Drizzle
6	Haze and smoke
7	Fog and haze
8	Fog and smoke

Note: Combinations of any two of the above conditions are reflected as dual numbers in the program, e.g., Fog and Haze-Smoke = 36.

*Corresponds to Table 15.

TABLE 38 Site codes for CHAMP data*

Code	Location
0811	Vista
0821	Santa Monica
0822	Thousand Oaks
0831	Anaheim
0832	Garden Grove
0841	Glendora
0842	West Covina

*Corresponds to Table 16.

TABLE 39 Pollutant codes for CHAMP data*

Code	Pollutant
17	Nitrogen Dioxide
19	Nitric Oxide
20	Carbon Monoxide
21	Gaseous Nitrates
22	Ozone
23	Hydrocarbons

*Corresponds to Table 16. All units in $\mu g/m^3$.

TABLE 40 Codes for pollutant measurement method for CHAMP data*

Code	Method
01	High-volume sampler
02	Andersen sampler
03	Open-face cassette
04	Cyclone separater
05	Dustfall bucket
06	Sulfation plate
07	Tape sampler
08	West-Gaeke (50 ml)
09	West-Gaeke (35 ml)
10	Jacobs-Hochheiser (50 ml)
11	Jacobs-Hochheiser (35 ml)
12	Arsenite (orifice)
13	Arsenite (frits)
14	TEA (orifice)
15	TEA (frits)
16	TGS (orifice)
17	Bendix (chemiluninescent)
18	Bendix (FP)
19	Technicon IV
20	Technicon II
21	Beckman (NIR)
22	Beckman (GC)
23	Beckman (F)
24	Meloy (chemiluminescent)
25	Meloy (FP)
26	Phillips (coulometric)

*Corresponds to Table 16.

TABLE 41 Site codes for wind and temperature data from Los Angeles Air Pollution Control District*

Code	Location
2W	Zuma Beach
5W	Terminal Island, San Pedro
12W	Redondo Beach
13W	Los Angeles International Airport
14W	Venice
21W	Long Beach Airport
22W	Downey
27W	Hollywood
34W	Vernon
41W	Lockheed Airport
61W	Ontario Airport
63W	Newport Beach
67W	Canoga Park
71W	Anaheim AMS
75W	APCD Headquarters, AMS
81W	Rivera
83W	Palmdale Airport
94W	Brackett Airport
95W	Buena Park
97W	Azusa AMS
98W	Lancaster
99W	La Habra AMS
100W	Burbank AMS
101W	Long Beach AMS
102W	West Los Angeles AMS
103W	Los Angeles City College
104W	Malibu
	Walnut
	Reseda AMS
	La Canada
109W	Pomona AMS
	Compton
113W	Mission Hills
	Whittier AMS
115W	Newhall AMS
117W	Lancaster AMS
	Lennox AMS
	Alhambra
	Hawthorne
	Saugus
122W	Pasadena AMS
	Marina Del Rey
	Mount Wilson
	Catalina
	Costa Mesa AMS
128W	Long Beach Blvd., Lynwood

*Corresponds to Tables 17 and 21.

TABLE 42 Site codes for radiometer data*

Code	Location	Data Measured
01; 27	Mt. Disappointment	Solar radiation
02; 26	Mt. Disappointment	Ultraviolet radiation
03; 13	L.A. International Airport	Solar radiation
04; 14	L.A. International Airport	Ultraviolet radiation
05	L.A. Air Pollution Control District Headquarters	Solar radiation
06; 15; 16	L.A. Air Pollution Control District Headquarters	Ultraviolet radiation
07	El Monte	Solar radiation
08; 23	El Monte	Ultraviolet radiation
09; 17	Upland	Solar radiation
10; 18	Upland	Ultraviolet radiation
11; 22	San Bernardino	Solar radiation
12; 20; 21	San Bernardino	Ultraviolet radiation

*Corresponds to Table 18.

TABLE 43 County and station codes for ARB data*

County and Station Location	Code
ORANGE COUNTY	30
Anaheim	176
La Habra	177
Orange County Airport	178
Huntington Beach	179
Newport Beach	180
Santa Ana Canyon	181
Costa Mesa - Mobile #4	182
Green River Golf Course	183
Los Alamitos Air Station	184
Costa Mesa (Harbor)	185
El Toro - 23022 El Toro Rd.	186
RIVERSIDE COUNTY	33
Riverside (11th St. Mall)	126
Beaumont	127
Corona	128
Indio	129
Hemet	130
Palm Springs	131
Blyth	132
Banning	133
Riverside (UCR Animal Facility)	134
Mira Loma	135
Upper Coachella Valley	136
Palm Springs	137
Thermal	138
Indio	139
Norco (Prado Park)	140
Hemet	141
Riverside Trailer	142
Palm Springs (Post Office)	143
Riverside (Mission Boulevard)	144
Indio (ARB)	145
Riverside (Magnolia)	146
Riverside (UCR Weather Shack)	147
Riverside (ARB O_x Satellite - UCR)	148
Perris	149
SAN BERNARDINO COUNTY	36
San Bernardino	151
Ontario (Chaffey H.S.)	152
Upland APCD (Justice Court)	153
Fontana	154

*Corresponds to Table 22.

TABLE 43 (cont'd.)

County and Station Location	Code
SAN BERNARDINO COUNTY (cont'd.)	36
Barstow	155
Upland UCR Lemon #1 (21st & Euclid Ave.)	160
Cucamonga UCR Lemon #2 (Ramon - Church St.)	161
Chino Airport	162
Upland Orange #1 UCR Wass Grove (23rd & Euclid)	164
Redlands	165
Rialto Airport	166
Alta Loma	167
Victorville	168
Needles High School	169
Fontana	170
Ontario Airport	171
Crestline	172
Chino (Riverside Ave.)	173
Upland (Civic Center)	174
Upland (ARB)	175
Fontana (Foothill)	176
Big Bear City (Moonridge)	177
29 Palms (Utah Trail)	178
VENTURA COUNTY	56
Ventura	401
Ojai	402
Thousand Oaks	403
Santa Paula	404
Oxnard	405
Fillmore	406
Camarillo (Magnolia)	407
Camarillo (Palm)	408
Point Mugu	409
Oxnard	410
Moorpark College	411
Port Hueneme	412
Simi	413
Ventura (Telegraph Rd.)	414
Thousand Oaks (Windsor)	415

*Corresponds to Table 22.

TABLE 44 Pollutant codes for ARB data*

Code	Pollutant	Units
12	Total Oxidants	PPHM
15	Carbon Monoxide	PPM
18	Sulfur Dioxide	PPHM
21	Nitrogen Dioxide	PPHM
23	Nitric Oxide	PPHM
29	Oxides of Nitrogen	PPHM
31	Total Hydrocarbons	PPMC
36	Ozone	PPHM

*Corresponds to Table 22.

TABLE 45 Site codes for CO CALTRANS bag sample data*

Code	Coordinate X	Coordinate Y
21	70.5	32.7
22	68.8	30.0
23	66.2	29.2
24	64.9	30.9
25	55.4	20.2
26	54.1	17.7
27	57.3	16.9
28	52.9	15.9
29	51.9	14.8
30	58.9	14
31	86.7	-1.3
32	86.2	-4.5
33	86.0	0.9

*Corresponds to Table 23.

TABLE 46 Site codes for CALTRANS van data*

Code	Coordinates X	Coordinates Y
40	86.7	-1.3
41	51.9	14.8
42	64.9	30.9
43	36.1	46.2

*Corresponds to Table 24.

APPENDIX I

LARPP DATA RECORD SPECIFICATIONS

```
**********************************************************************
*     H E L I C O P T E R   R E C O R D   D E F I N I T I O N S      *
**********************************************************************
FILE,1,RECD,1510
RECORD,HELID,25,1,/01,2
FORMAT(A2,A6,1X,A1,80X,A3,A1,A2,2A6,2A4,A2,F4,9F6.2,4F5.1)
FIELD,TYPE,01,2,A
FIELD,TIME,02,6,A
FIELD,TN,03,1,A
FIELD,JULD,04,3,A
FIELD,BT,05,1,A
FIELD,ID,06,2,A
FIELD,CMANV,07,6,A
FIELD,T    ,08,6,A
FIELD,TMXP ,09,4,A
FIELD,TMYP ,10,4,A
FIELD,BSAMP,11,2,A
FIELD,FPT  ,12,4,H
FIELD,NU   ,13,6,H
FIELD,NUX  ,14,6,H
FIELD,MSCT ,15,6,H
FIELD,CU   ,16,6,H
FIELD,TEMP ,17,6,H
FIELD,DEWPT,18,6,H
FIELD,WMMC ,19,6,H
FIELD,CMH  ,20,6,H
FIELD,US   ,21,6,H
FIELD,XMPUS,22,5,H
FIELD,YMPUS,23,5,H
FIELD,MSL  ,24,5,H
FIELD,AGL  ,25,5,H
**********************************************************************
*     A R U - V A N   R E C O R D   D E F I N I T I O N S            *
**********************************************************************
RECORD,ARUVAN,15,1,/02,2
FORMAT(A2,A6,62X,A6,7F6.2,I1,2F4.1,2F3)
FIELD,TYPE ,01,2,A
FIELD,TIME ,02,6,A
FIELD,T    ,03,6,A
FIELD,CMH  ,04,6,H
FIELD,US   ,05,6,H
FIELD,NU   ,06,6,H
FIELD,NUX  ,07,6,H
FIELD,TUTMC,08,6,H
FIELD,CU   ,09,6,H
FIELD,FPT  ,10,6,H
FIELD,MS   ,11,1,I
FIELD,XMPUS,12,4,H
FIELD,YMPUS,13,4,H
FIELD,TEMP ,14,3,H
FIELD,HUMID,15,3,H
@@
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*****************************************************************************
*     HELICOPTER RADAR RECORD  DEFINITION                                   *
*****************************************************************************
RECORD,HRADAR,9,1,/03,2
FORMAT(A2,A6,2X,2A6,I1,4F9.1)
FIELD,TYPE,01,2,A
FIELD,TIME,02,6,A
FIELD,DATE,03,6,A
FIELD,T    ,04,6,A
FIELD,ID   ,05,1,I
FIELD,Y-POS,06,9,M
FIELD,X-POS,07,9,M
FIELD,MSL  ,08,9,M
FIELD,GND  ,09,9,M
*****************************************************************************
*     T E T H E R   R E C O R D   D E F I N I T I O N S                     *
*****************************************************************************
RECORD,TETHER,9,1,/04,2
FORMAT(A2,A6,2X,2A6,2F9.1,2F5,I1)
FIELD,TYPE,01,2,A
FIELD,TIME,02,6,A
FIELD,DATE,03,6,A
FIELD,T    ,04,6,A
FIELD,X-POS,05,9,M
FIELD,Y-POS,06,9,M
FIELD,TT-MT,07,5,M
FIELD,TH-MT,08,5,M
FIELD,ID   ,09,1,I
*****************************************************************************
*     A P C U   R E C O R D   D E F I N I T I O N S                         *
*****************************************************************************
RECORD,APCU,17,1,/05,2
FORMAT(A2,A6,2X,2A3,11F3,2I2)
FIELD,TYPE,01,2,A
FIELD,TIME,02,6,A
FIELD,JULD,03,3,A
FIELD,STAT,04,3,M
FIELD,NMHC,05,3,M
FIELD,O3   ,06,3,M
FIELD,CO   ,07,3,M
FIELD,SO2  ,08,3,M
FIELD,NO2  ,09,3,M
FIELD,NO   ,10,3,M
FIELD,NOX  ,11,3,M
FIELD,CH4  ,12,3,M
FIELD,TEMP,13,3,M
FIELD,HUMD,14,3,M
FIELD,RAD  ,15,3,M
FIELD,WDR  ,16,2,I
FIELD,WSP  ,17,2,I
**
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*****************************************************************
*     G A S   C H R O M A T O G R A P H   R E C O R D   D E F .   *
*****************************************************************
RECORD,GC1,22,1,/06,2,10,/1,1
FORMAT(A2,A6,1X,I1,13,I1,A2,A9,14F4.1,F4.2)
FIELD,TYPE   ,01,2,A
FIELD,TIME,02,6,A
FIELD,CODE   ,03,1,I
FIELD,JDATE ,04,5,I
FIELD,VEM    ,05,1,I
FIELD,MS     ,06,2,A
FIELD,LOC    ,07,9,A
FIELD,ETHANE,08,4,R
FIELD,ETHYLE,09,4,R
FIELD,ACETYL,10,4,R
FIELD,PROPAN,11,4,R
FIELD,PROPYL,12,4,R
FIELD,ISOBUT,13,4,R
FIELD,N-BUTA,14,4,R
FIELD,1-BUTE,15,4,R
FIELD,IB+T2B,16,4,R
FIELD,ISOPEN,17,4,R
FIELD,N-PENT,18,4,R
FIELD,CYCPEN,19,4,R
FIELD,1-PENT,20,4,R
FIELD,HEXANE,21,4,R
FIELD,METHAN,22,4,R
RECORD,GC2,23,1,/06,2,10,/2,1
FORMAT(A2,A6,1X,I1,13,I1,I2,A9,14F4.1,F4.2,F4.1)
FIELD,TYPE   ,01,2,A
FIELD,TIME,02,6,A
FIELD,CODE   ,03,1,I
FIELD,JDATE ,04,5,I
FIELD,VEM    ,05,1,I
FIELD,MS     ,06,2,I
FIELD,LOC    ,07,9,A
FIELD,ETHANE,08,4,R
FIELD,ETHYLE,09,4,R
FIELD,ACETYL,10,4,R
FIELD,PROPAN,11,4,R
FIELD,PROPYL,12,4,R
FIELD,ISOBUT,13,4,R
FIELD,N-BUTA,14,4,R
FIELD,1-BUTE,15,4,R
FIELD,IB+T2B,16,4,R
FIELD,ISOPEN,17,4,R
FIELD,N-PENT,18,4,R
FIELD,CYCPEN,19,4,R
FIELD,1-PENT,20,4,R
FIELD,HEXANE,21,4,R
FIELD,METHAN,22,4,R
FIELD,PROPAD,23,4,R
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RECORD,UC3,50,1,/00,2,10,/3,1
FORMAT(A2,A6,1X,11,13,11,12,A9,14F4.1,F4,2,36F4.1)
FIELD,TYPE   ,01,2,A
FIELD,TIME,02,6,A
FIELD,CODE   ,05,1,I
FIELD,JDATE  ,04,5,I
FIELD,VEH    ,05,1,I
FIELD,BD     ,06,2,I
FIELD,LOC    ,07,9,A
FIELD,ETHANE,08,4,R
FIELD,ETHYLE,09,4,R
FIELD,ACETYL,10,4,R
FIELD,PROPAN,11,4,R
FIELD,PROPYL,12,4,R
FIELD,ISOBUT,13,4,R
FIELD,N-BUTA,14,4,R
FIELD,1-BUTE,15,4,R
FIELD,ISOPEN,16,4,R
FIELD,ISOPEN,17,4,R
FIELD,N-PENT,18,4,R
FIELD,CYCPEN,19,4,R
FIELD,1-PENT,20,4,R
FIELD,HEXANE,21,4,R
FIELD,METHAN,22,4,R
FIELD,2-3DMB,23,4,R
FIELD,2-MPEN,24,4,R
FIELD,3-MPEN,25,4,R
FIELD,N-HEX  ,26,4,R
FIELD,MCYPEN ,27,4,R
FIELD,2-4DMP,28,4,R
FIELD,3-3DMP,29,4,R
FIELD,2-MHEX,30,4,R
FIELD,2-3DMP,31,4,R
FIELD,3-MHEX,32,4,R
FIELD,1C3DCP,33,4,R
FIELD,1T3DCP,34,4,R
FIELD,3-EPEN,35,4,R
FIELD,224TMP,36,4,R
FIELD,N-HEPT ,37,4,R
FIELD,1C2DCP,38,4,R
FIELD,MCYHEX ,39,4,R
FIELD,2-3DMH,40,4,R
FIELD,2-4DMH,41,4,R
FIELD,1T2CPT,42,4,R
FIELD,TOLUEN ,43,4,R
FIELD,1T2CBT,44,4,R
FIELD,234TMP,45,4,R
FIELD,235TMP,46,4,R
FIELD,2-3DMH,47,4,R
FIELD,2-MHEP,48,4,R
FIELD,3-MHEP,49,4,R
FIELD,225TMH,50,4,R
FIELD,1-1DCM,51,4,R
FIELD,1T4DCM,52,4,R
FIELD,N-OCTA ,53,4,R
FIELD,ETHBEN ,54,4,R
FIELD,M-XYLE ,55,4,R
FIELD,P-XYLE ,56,4,R
FIELD,O-XYLE ,57,4,R
FIELD,N-NONA ,58,4,R

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**********************************************************************
*     BATTELLE  RECORD  DEFINITIONS                                  *
**********************************************************************
RECORD,BATTELLE,14,1,/07,2
FORMAT(A2,A6,2X,12F6.3)
FIELD,TYPE,01,2,A
FIELD,TIME,02,6,A
FIELD,GIMM,03,6,R
FIELD,WSPD,04,6,R
FIELD,WDEG,05,6,R
FIELD,TEMP,06,6,R
FIELD,HUMD,07,6,R
FIELD,SCAT,08,6,R
FIELD,SO2 ,09,6,R
FIELD,O3  ,10,6,R
FIELD,NO  ,11,6,R
FIELD,NO2 ,12,6,R
FIELD,NOX ,13,6,R
FIELD,NM4 ,14,6,R
**********************************************************************
*     EL MONTE LAB RECORD DEFINITION                                 *
**********************************************************************
RECORD,ELMONTE,15,1,/08,2
FORMAT(A2,A6,2X,A6,3F4.2,4F4.1,F4.2,F4.0,F4.1,2F4.0)
FIELD,TYPE,01,2,A
FIELD,TIME,02,6,A
FIELD,DATE,03,6,A
FIELD,OX  ,04,4,R
FIELD,NO  ,05,4,R
FIELD,NO2 ,06,4,R
FIELD,SO2 ,07,4,R
FIELD,CO  ,08,4,R
FIELD,THC ,09,4,R
FIELD,HSCT,10,4,R
FIELD,WEMM,11,4,R
FIELD,HELM,12,4,R
FIELD,TEMP,13,4,R
FIELD,WS  ,14,4,R
FIELD,WD  ,15,4,R
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**********************************************************************
*     WIND AND TEMPERATURE FROM C-T STATIONS RECORD DEFINITION        *
**********************************************************************
RECORD,CTWINDS,35,1,/10,2
FORMAT(A2,2A6,8(A2,I3,2I2))
FIELD,TYPE,01,2,A
FIELD,TIME,02,6,A
FIELD,DATE,03,6,A
FIELD,SITE1,04,2,A
FIELD,WD1  ,05,3,I
FIELD,WS1  ,06,2,I
FIELD,TEMP1,07,2,I
FIELD,SITE2,08,2,A
FIELD,WD2  ,09,3,I
FIELD,WS2  ,10,2,I
FIELD,TEMP2,11,2,I
FIELD,SITE3,12,2,A
FIELD,WD3  ,13,3,I
FIELD,WS3  ,14,2,I
FIELD,TEMP3,15,2,I
FIELD,SITE4,16,2,A
FIELD,WD4  ,17,3,I
FIELD,WS4  ,18,2,I
FIELD,TEMP4,19,2,I
FIELD,SITE5,20,2,A
FIELD,WD5  ,21,3,I
FIELD,WS5  ,22,2,I
FIELD,TEMP5,23,2,I
FIELD,SITE6,24,2,A
FIELD,WD6  ,25,3,I
FIELD,WS6  ,26,2,
FIELD,TEMP6,27,2,I
FIELD,SITE7,28,2,A
FIELD,WD7  ,29,3,I
FIELD,WS7  ,30,2,I
FIELD,TEMP7,31,2,I
FIELD,SITE8,32,2,A
FIELD,WD8  ,33,3,I
FIELD,WS8  ,34,2,I
FIELD,TEMP8,35,2,I
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```

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*****************************************************************************
*      MANUAL HELICOPTER DATA RECORD DEFINITION                             *
*****************************************************************************
RECORD,MHELIO,25,1,/11,2
FORMAT(A2,A6,1X,A1,80X,A3,A1,A2,2A6,2A4,A2,F4,9F6.2,4F5.1)
FIELD,TYPE,01,2,A
FIELD,TIME,02,6,A
FIELD,TN,03,1,A
FIELD,JULD,04,3,A
FIELD,BT,05,1,A
FIELD,ID,06,2,A
FIELD,CHANV,07,6,A
FIELD,T     ,08,6,A
FIELD,TMXP ,09,4,A
FIELD,TMYP ,10,4,A
FIELD,BSAMP,11,2,A
FIELD,FPT   ,12,4,R
FIELD,NO    ,13,6,R
FIELD,NOX   ,14,6,R
FIELD,BSCT ,15,6,R
FIELD,CO    ,16,6,R
FIELD,TEMP ,17,6,R
FIELD,DEWPT,18,6,R
FIELD,NMHC ,19,6,R
FIELD,CH4  ,20,6,R
FIELD,O3   ,21,6,R
FIELD,X-POS,22,5,R
FIELD,Y-POS,23,5,R
FIELD,MSL  ,24,5,R
FIELD,AGL  ,25,5,R
*****************************************************************************
*      MANUAL AMB VAN DATA RECORD DEFINITION                                *
*****************************************************************************
RECORD,MAMBVN,15,1,/12,2
FORMAT(A2,A6,52X,A6,7F6.2,I1,2F4.1,2F3)
FIELD,TYPE ,01,2,A
FIELD,TIME ,02,6,A
FIELD,T     ,03,6,A
FIELD,CH4  ,04,6,R
FIELD,O3   ,05,6,R
FIELD,NO   ,06,6,R
FIELD,NOX  ,07,6,R
FIELD,TOTHC,08,6,R
FIELD,CO   ,09,6,R
FIELD,FPT  ,10,6,R
FIELD,MS   ,11,1,I
FIELD,X-POS,12,4,R
FIELD,Y-POS,13,4,R
FIELD,TEMP ,14,3,R
FIELD,HUMID,15,3,R
**
```

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*****************************************************************************
*      TRAFFIC COUNT RECORD DEFINITION                                      *
*****************************************************************************
RECORD,TRAFFIC,58,1,/13,2
FORMAT(A2,2A6,7(2A1,I4,A1,I4))
FIELD,TYPE,01,2,A
FIELD,TIME,02,6,A
FIELD,DATE,03,6,A
FIELD,SITE01,04,1,A
FIELD,DIR101,05,1,A
FIELD,CNT101,06,4,I
FIELD,DIR201,07,1,A
FIELD,CNT201,08,4,I
FIELD,SITE02,09,1,A
FIELD,DIR102,10,1,A
FIELD,CNT102,11,4,I
FIELD,DIR202,12,1,A
FIELD,CNT202,13,4,I
FIELD,SITE03,14,1,A
FIELD,DIR103,15,1,A
FIELD,CNT103,16,4,I
FIELD,DIR203,17,1,A
FIELD,CNT203,18,4,I
FIELD,SITE04,19,1,A
FIELD,DIR104,20,1,A
FIELD,CNT104,21,4,I
FIELD,DIR204,22,1,A
FIELD,CNT204,23,4,I
FIELD,SITE05,24,1,A
FIELD,DIR105,25,1,A
FIELD,CNT105,26,4,I
FIELD,DIR205,27,1,A
FIELD,CNT205,28,4,I
FIELD,SITE06,29,1,A
FIELD,DIR106,30,1,A
FIELD,CNT106,31,4,I
FIELD,DIR206,32,1,A
FIELD,CNT206,33,4,I
FIELD,SITE07,34,1,A
FIELD,DIR107,35,1,A
FIELD,CNT107,36,4,I
FIELD,DIR207,37,1,A
FIELD,CNT207,38,4,I
**
```

```
*****************************************************************************
*      AIRPORT  RECORD DEFINITION                                           *
*****************************************************************************
RECORD,AIRPORT,16,1,/14,2
FORMAT(A2,2A6,A5,2(I1,I5),F3,1,I2,F5,1,F4,2,2I2,I3,F4,1)
FIELD,TYPE,01,2,A
FIELD,TIME,02,6,A
FIELD,DATE,03,6,A
FIELD,SITE,04,5,A
FIELD,CCLD,05,1,I
FIELD,LOCEIL,06,5,I
FIELD,CCMI,07,1,I
FIELD,MICEIL,08,5,I
FIELD,VIS   ,09,5,R
FIELD,OBSVIS,10,2,I
FIELD,MAXR  ,11,5,R
FIELD,INMG  ,12,4,R
FIELD,TEMP  ,13,2,I
FIELD,DEWPT ,14,2,I
FIELD,WD    ,15,3,I
FIELD,WS    ,16,4,R
```

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*****************************************************************************
*     CHAMP DATA RECORD DEFINITION                                          *
*****************************************************************************
RECORD,CHAMP,171,1,/15,2
FORMAT(A2,2A6,42(I4,2I2,F7.1))
FIELD,TYPE     ,01,2,A
FIELD,TIME     ,02,6,A
FIELD,DATE     ,03,6,A
FIELD,SITE01,004,4,I
FIELD,POLL,005,2,I
FIELD,METH,006,2,I
FIELD,CONC,007,11,R
FIELD,SITE02,008,4,I
FIELD,POLL,009,2,I
FIELD,METH,010,2,I
FIELD,CONC,011,11,R
FIELD,SITE03,012,4,I
FIELD,POLL,013,2,I
FIELD,METH,014,2,I
FIELD,CONC,015,11,R
FIELD,SITE04,016,4,I
FIELD,POLL,017,2,I
FIELD,METH,018,2,I
FIELD,CONC,019,11,R
FIELD,SITE05,020,4,I
FIELD,POLL,021,2,I
FIELD,METH,022,2,I
FIELD,CONC,023,11,R
FIELD,SITE06,024,4,I
FIELD,POLL,025,2,I
FIELD,METH,026,2,I
FIELD,CONC,027,11,R
FIELD,SITE07,028,4,I
FIELD,POLL,029,2,I
FIELD,METH,030,2,I
FIELD,CONC,031,11,R
FIELD,SITE08,032,4,I
FIELD,POLL,033,2,I
FIELD,METH,034,2,I
FIELD,CONC,035,11,R
FIELD,SITE09,036,4,I
FIELD,POLL,037,2,I
FIELD,METH,038,2,I
FIELD,CONC,039,11,R
FIELD,SITE10,040,4,I
FIELD,POLL,041,2,I
FIELD,METH,042,2,I
FIELD,CONC,043,11,R
FIELD,SITE11,044,4,I
FIELD,POLL,045,2,I
FIELD,METH,046,2,I
FIELD,CONC,047,11,R
FIELD,SITE12,048,4,I
FIELD,POLL,049,2,I
FIELD,METH,050,2,I
FIELD,CONC,051,11,R
FIELD,SITE13,052,4,I
FIELD,POLL,053,2,I
FIELD,METH,054,2,I
FIELD,CONC,055,11,R
FIELD,SITE14,056,4,I
FIELD,POLL,057,2,I
FIELD,METH,058,2,I
FIELD,CONC,059,11,R
FIELD,SITE15,060,4,I
FIELD,POLL,061,2,I
FIELD,METH,062,2,I
FIELD,CONC,063,11,R
FIELD,SITE16,064,4,I
FIELD,POLL,065,2,I
FIELD,METH,066,2,I
FIELD,CONC,067,11,R
FIELD,SITE17,068,4,I
FIELD,POLL,069,2,I
FIELD,METH,070,2,I
FIELD,CONC,071,11,R
FIELD,SITE18,072,4,I
FIELD,POLL,073,2,I
FIELD,METH,074,2,I
FIELD,CONC,075,11,R
FIELD,SITE19,076,4,I
FIELD,POLL,077,2,I
FIELD,METH,078,2,I
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FIELD,CONC,.79,.1,R
FIELD,SITE20,080,4,I
FIELD,POLL,081,2,I
FIELD,METH,082,2,I
FIELD,CONC,083,11,R
FIELD,SITE21,084,4,I
FIELD,POLL,085,2,I
FIELD,METH,086,2,I
FIELD,CONC,087,11,R
FIELD,SITE22,088,4,I
FIELD,POLL,089,2,I
FIELD,METH,090,2,I
FIELD,CONC,091,11,R
FIELD,SITE23,092,4,I
FIELD,POLL,093,2,I
FIELD,METH,094,2,I
FIELD,CONC,095,11,R
FIELD,SITE24,096,4,I
FIELD,POLL,097,2,I
FIELD,METH,098,2,I
FIELD,CONC,099,11,R
FIELD,SITE25,100,4,I
FIELD,POLL,101,2,I
FIELD,METH,102,2,I
FIELD,CONC,103,11,R
FIELD,SITE26,104,4,I
FIELD,POLL,105,2,I
FIELD,METH,106,2,I
FIELD,CONC,107,11,R
FIELD,SITE27,108,4,I
FIELD,POLL,109,2,I
FIELD,METH,110,2,I
FIELD,CONC,111,11,R
FIELD,SITE28,112,4,I
FIELD,POLL,113,2,I
FIELD,METH,114,2,I
FIELD,CONC,115,11,R
FIELD,SITE29,116,4,I
FIELD,POLL,117,2,I
FIELD,METH,118,2,I
FIELD,CONC,119,11,R
FIELD,SITE30,120,4,I
FIELD,POLL,121,2,I
FIELD,METH,122,2,I
FIELD,CONC,123,11,R
FIELD,SITE31,124,4,I
FIELD,POLL,125,2,I
FIELD,METH,126,2,I
FIELD,CONC,127,11,R
FIELD,SITE32,128,4,I
FIELD,POLL,129,2,I
FIELD,METH,130,2,I
FIELD,CONC,131,11,R
FIELD,SITE33,132,4,I
FIELD,POLL,133,2,I
FIELD,METH,134,2,I
FIELD,CONC,135,11,R
FIELD,SITE34,136,4,I
FIELD,POLL,137,2,I
FIELD,METH,138,2,I
FIELD,CONC,139,11,R
FIELD,SITE35,140,4,I
FIELD,POLL,141,2,I
FIELD,METH,142,2,I
FIELD,CONC,143,11,R
FIELD,SITE36,144,4,I
FIELD,POLL,145,2,I
FIELD,METH,146,2,I
FIELD,CONC,147,11,R
FIELD,SITE37,148,4,I
FIELD,POLL,149,2,I
FIELD,METH,150,2,I
FIELD,CONC,151,11,R
FIELD,SITE38,152,4,I
FIELD,POLL,153,2,I
FIELD,METH,154,2,I
FIELD,CONC,155,11,R
FIELD,SITE39,156,4,I
FIELD,POLL,157,2,I
FIELD,METH,158,2,I
FIELD,CONC,159,11,R
FIELD,SITE40,160,4,I
FIELD,POLL,161,2,I
FIELD,METH,162,2,I
FIELD,CONC,163,11,R
FIELD,SITE41,164,4,I
FIELD,POLL,165,2,I
FIELD,METH,166,2,I
FIELD,CONC,167,11,R
FIELD,SITE42,168,4,I
FIELD,POLL,169,2,I
FIELD,METH,170,2,I
FIELD,CONC,171,11,R
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**********************************************************************************
*      TEMP AND HUMIDITY RECORD DEFINITION                                       *
**********************************************************************************
RECORD,TMHLA,21,1,/16,2
FORMAT(A2,2A6,8(A4,2I2))
FIELD,TYPE,01,2,A
FIELD,TIME,02,6,A
FIELD,DATE,03,6,A
FIELD,SITE01,04,4,A
FIELD,TEMP01,05,2,I
FIELD,RELH01,06,2,I
FIELD,SITE02,07,4,A
FIELD,TEMP02,08,2,I
FIELD,RELH02,09,2,I
FIELD,SITE03,10,4,A
FIELD,TEMP03,11,2,I
FIELD,RELH03,09,2,I
FIELD,SITE04,13,4,A
FIELD,TEMP04,14,2,I
FIELD,RELH04,09,2,I
FIELD,SITE05,16,4,A
FIELD,TEMP05,17,2,I
FIELD,RELH05,09,2,I
FIELD,SITE06,19,4,A
FIELD,TEMP06,20,2,I
FIELD,RELH06,09,2,I
**

**********************************************************************************
*      RADIOMETER RECORD DEFINITION                                              *
**********************************************************************************
RECORD,SOLAR,51,1,/17,2
FORMAT(A2,2A6,24(A2,F3.1))
FIELD,TYPE,01,2,A
FIELD,TIME,02,6,A
FIELD,DATE,03,6,A
FIELD,SITE01,04,2,A
FIELD,RAD 01,05,3,R
FIELD,SITE02,08,2,A
FIELD,RAD 02,07,3,R
FIELD,SITE03,08,2,A
FIELD,RAD 03,09,3,R
FIELD,SITE04,10,2,A
FIELD,RAD 04,11,3,R
FIELD,SITE05,12,2,A
FIELD,RAD 05,13,3,R
FIELD,SITE06,14,2,A
FIELD,RAD 06,15,3,R
FIELD,SITE07,16,2,A
FIELD,RAD 07,17,3,R
FIELD,SITE08,18,2,A
FIELD,RAD 08,19,3,R
FIELD,SITE09,20,2,A
FIELD,RAD 09,21,3,R
FIELD,SITE10,22,2,A
FIELD,RAD 10,23,3,R
FIELD,SITE11,24,2,A
FIELD,RAD 11,25,3,R
FIELD,SITE12,26,2,A
FIELD,RAD 12,27,3,R
FIELD,SITE13,28,2,A
FIELD,RAD 13,29,3,R
FIELD,SITE14,30,2,A
FIELD,RAD 14,31,3,R
FIELD,SITE15,32,2,A
FIELD,RAD 15,33,3,R
FIELD,SITE16,34,2,A
FIELD,RAD 16,35,3,R
FIELD,SITE17,36,2,A
FIELD,RAD 17,37,3,R
FIELD,SITE18,38,2,A
FIELD,RAD 18,39,3,R
FIELD,SITE19,40,2,A
FIELD,RAD 19,41,3,R
FIELD,SITE20,42,2,A
FIELD,RAD 20,43,3,R
FIELD,SITE21,44,2,A
FIELD,RAD 21,45,3,R
FIELD,SITE22,46,2,A
FIELD,RAD 22,47,3,R
FIELD,SITE23,48,2,A
FIELD,RAD 23,49,3,R
FIELD,SITE24,50,2,A
FIELD,RAD 24,51,3,R
**
```

```
*****************************************************************************
*     EMSU RECORD DEFINITION                                                *
*****************************************************************************
RECORD,EMSU,20,1,/18,2
FORMAT(A2,2A6,4(A2,2I4,F3.1,I3))
FIELD,TYPE,01,2,A
FIELD,TIME,02,6,A
FIELD,DATE,03,6,A
FIELD,ALT1,05,4,I
FIELD,MB 1,06,4,I
FIELD,TMP1,07,3,R
FIELD,RH 1,08,3,I
FIELD,ALT2,09,4,I
FIELD,MB 2,10,4,I
FIELD,TMP2,11,3,R
FIELD,RH 2,12,3,I
FIELD,ALT3,13,4,I
FIELD,MB 3,14,4,I
FIELD,TMP3,15,3,R
FIELD,RH 3,16,3,I
FIELD,ALT4,17,4,I
FIELD,MB 4,18,4,I
FIELD,TMP4,19,3,R
FIELD,RH 4,20,3,I
*****************************************************************************
*     FATE OF NOX RECORD DEFINITION                                         *
*****************************************************************************
RECORD,NITRATE,5,1,/19,2
FORMAT(A2,2A6,2X,2I5)
FIELD,TYPE,01,2,A
FIELD,TIME,02,6,A
FIELD,DATE,03,6,A
FIELD,PAN ,04,5,I
FIELD,HNO3,05,5,I
*****************************************************************************
*     LAAPCO WIND DATA RECORD DEFINITION                                    *
*****************************************************************************
RECORD,METDAT,105,1,/20,2
FORMAT(A2,2A6,34(A4,2I2))
FIELD,TYPE,001,2,A
FIELD,TIME,002,6,A
FIELD,DATE,005,6,A
FIELD,SITE01,004,4,A
FIELD,*D01  ,005,2,I
FIELD,*S01  ,006,2,I
FIELD,SITE02,007,4,A
FIELD,*D02  ,008,2,I
FIELD,*S02  ,009,2,I
FIELD,SITE03,010,4,A
FIELD,*D03  ,011,2,I
FIELD,*S03  ,012,2,I
FIELD,SITE04,013,4,A
FIELD,*D04  ,014,2,I
FIELD,*S04  ,015,2,I
FIELD,SITE05,016,4,A
FIELD,*D05  ,017,2,I
FIELD,*S05  ,018,2,I
FIELD,SITE06,019,4,A
FIELD,*D06  ,020,2,I
FIELD,*S06  ,021,2,I
```

```
FIELD,SITE07,022,4,A
FIELD,*D07  ,023,2,I
FIELD,*S07  ,024,2,I
FIELD,SITE08,025,4,A
FIELD,*D08  ,026,2,I
FIELD,*S08  ,027,2,I
FIELD,SITE09,028,4,A
FIELD,*D09  ,029,2,I
FIELD,*S09  ,030,2,I
FIELD,SITE10,031,4,A
FIELD,*D10  ,032,2,I
FIELD,*S10  ,033,2,I
FIELD,SITE11,034,4,A
FIELD,*D11  ,035,2,I
FIELD,*S11  ,036,2,I
FIELD,SITE12,037,4,A
FIELD,*D12  ,038,2,I
FIELD,*S12  ,039,2,I
FIELD,SITE13,040,4,A
FIELD,*D13  ,041,2,I
FIELD,*S13  ,042,2,I
FIELD,SITE14,043,4,A
FIELD,*D14  ,044,2,I
FIELD,*S14  ,045,2,I
FIELD,SITE15,046,4,A
FIELD,*D15  ,047,2,I
FIELD,*S15  ,048,2,I
FIELD,SITE16,049,4,A
FIELD,*D16  ,050,2,I
FIELD,*S16  ,051,2,I
FIELD,SITE17,052,4,A
FIELD,*D17  ,053,2,I
FIELD,*S17  ,054,2,I
FIELD,SITE18,055,4,A
FIELD,*D18  ,056,2,I
FIELD,*S18  ,057,2,I
FIELD,SITE19,058,4,A
FIELD,*D19  ,059,2,I
FIELD,*S19  ,060,2,I
FIELD,SITE20,061,4,A
FIELD,*D20  ,062,2,I
FIELD,*S20  ,063,2,I
FIELD,SITE21,064,4,A
FIELD,*D21  ,065,2,I
FIELD,*S21  ,066,2,I
FIELD,SITE22,067,4,A
FIELD,*D22  ,068,2,I
FIELD,*S22  ,069,2,I
FIELD,SITE23,070,4,A
FIELD,*D23  ,071,2,I
FIELD,*S23  ,072,2,I
FIELD,SITE24,073,4,A
FIELD,*D24  ,074,2,I
FIELD,*S24  ,075,2,I
FIELD,SITE25,076,4,A
FIELD,*D25  ,077,2,I
FIELD,*S25  ,078,2,I
FIELD,SITE26,079,4,A
FIELD,*D26  ,080,2,I
FIELD,*S26  ,081,2,I
FIELD,SITE27,082,4,A
FIELD,*D27  ,083,2,I
FIELD,*S27  ,084,2,I
FIELD,SITE28,085,4,A
FIELD,*D28  ,086,2,I
FIELD,*S28  ,087,2,I
FIELD,SITE29,088,4,A
FIELD,*D29  ,089,2,I
FIELD,*S29  ,090,2,I
FIELD,SITE30,091,4,A
FIELD,*D30  ,092,2,I
FIELD,*S30  ,093,2,I
FIELD,SITE31,094,4,A
FIELD,*D31  ,095,2,I
FIELD,*S31  ,096,2,I
FIELD,SITE32,097,4,A
FIELD,*D32  ,098,2,I
FIELD,*S32  ,099,2,I
FIELD,SITE33,100,4,A
FIELD,*D33  ,101,2,I
FIELD,*S33  ,102,2,I
FIELD,SITE34,103,4,A
FIELD,*D34  ,104,2,I
FIELD,*S34  ,105,2,I
**
```

```
*****************************************************************************
*     ARB DATA RECORD DEFINITION                                            *
*****************************************************************************
RECORD,ARBCTY,261,1,/21,2
FORMAT(A2,246,129(I7,I3))
FIELD,TYPE,001,2,A
FIELD,TIME,002,6,A
FIELD,DATE,003,6,A
FIELD,CODE001,004,7,I
FIELD,CONC001,005,3,I
FIELD,CODE002,006,7,I
FIELD,CONC002,007,3,I
FIELD,CODE003,008,7,I
FIELD,CONC003,009,3,I
FIELD,CODE004,010,7,I
FIELD,CONC004,011,3,I
FIELD,CODE005,012,7,I
FIELD,CONC005,013,3,I
FIELD,CODE006,014,7,I
FIELD,CONC006,015,3,I
FIELD,CODE007,016,7,I
FIELD,CONC007,017,3,I
FIELD,CODE008,018,7,I
FIELD,CONC008,019,3,I
FIELD,CODE009,020,7,I
FIELD,CONC009,021,3,I
FIELD,CODE010,022,7,I
FIELD,CONC010,023,3,I
FIELD,CODE011,024,7,I
FIELD,CONC011,025,3,I
FIELD,CODE012,026,7,I
FIELD,CONC012,027,3,I
FIELD,CODE013,028,7,I
FIELD,CONC013,029,3,I
FIELD,CODE014,030,7,I
FIELD,CONC014,031,3,I
FIELD,CODE015,032,7,I
FIELD,CONC015,033,3,I
FIELD,CODE016,034,7,I
FIELD,CONC016,035,3,I
FIELD,CODE017,036,7,I
FIELD,CONC017,037,3,I
FIELD,CODE018,038,7,I
FIELD,CONC018,039,3,I
FIELD,CODE019,040,7,I
FIELD,CONC019,041,3,I
FIELD,CODE020,042,7,I
FIELD,CONC020,043,3,I
FIELD,CODE021,044,7,I
FIELD,CONC021,045,3,I
FIELD,CODE022,046,7,I
FIELD,CONC022,047,3,I
FIELD,CODE023,048,7,I
FIELD,CONC023,049,3,I
FIELD,CODE024,050,7,I
FIELD,CONC024,051,3,I
FIELD,CODE025,052,7,I
FIELD,CONC025,053,3,I
FIELD,CODE026,054,7,I
FIELD,CONC026,055,3,I
```

```
FIELD,CODE027,056,7,I
FIELD,CONC027,057,3,I
FIELD,CODE028,058,7,I
FIELD,CONC028,059,3,I
FIELD,CODE029,060,7,I
FIELD,CONC029,061,3,I
FIELD,CODE030,062,7,I
FIELD,CONC030,063,3,I
FIELD,CODE031,064,7,I
FIELD,CONC031,065,3,I
FIELD,CODE032,066,7,I
FIELD,CONC032,067,3,I
FIELD,CODE033,068,7,I
FIELD,CONC033,069,3,I
FIELD,CODE034,070,7,I
FIELD,CONC034,071,3,I
FIELD,CODE035,072,7,I
FIELD,CONC035,073,3,I
FIELD,CODE036,074,7,I
FIELD,CONC036,075,3,I
FIELD,CODE037,076,7,I
FIELD,CONC037,077,3,I
FIELD,CODE038,078,7,I
FIELD,CONC038,079,3,I
FIELD,CODE039,080,7,I
FIELD,CONC039,081,3,I
FIELD,CODE040,082,7,I
FIELD,CONC040,083,3,I
FIELD,CODE041,084,7,I
FIELD,CONC041,085,3,I
FIELD,CODE042,086,7,I
FIELD,CONC042,087,3,I
FIELD,CODE043,088,7,I
FIELD,CONC043,089,3,I
FIELD,CODE044,090,7,I
FIELD,CONC044,091,3,I
FIELD,CODE045,092,7,I
FIELD,CONC045,093,3,I
FIELD,CODE046,094,7,I
FIELD,CONC046,095,3,I
FIELD,CODE047,096,7,I
FIELD,CONC047,097,3,I
FIELD,CODE048,098,7,I
FIELD,CONC048,099,3,I
FIELD,CODE049,100,7,I
FIELD,CONC049,101,3,I
FIELD,CODE050,102,7,I
FIELD,CONC050,103,3,I
FIELD,CODE051,104,7,I
FIELD,CONC051,105,3,I
FIELD,CODE052,106,7,I
FIELD,CONC052,107,3,I
FIELD,CODE053,108,7,I
FIELD,CONC053,109,3,I
FIELD,CODE054,110,7,I
FIELD,CONC054,111,3,I
FIELD,CODE055,112,7,I
FIELD,CONC055,113,3,I
FIELD,CODE056,114,7,I
FIELD,CONC056,115,3,I
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FIELD,CODE057,116,7,I
FIELD,CONC057,117,5,I
FIELD,CODE058,118,7,I
FIELD,CONC058,119,5,I
FIELD,CODE059,120,7,I
FIELD,CONC059,121,3,I
FIELD,CODE060,122,7,I
FIELD,CONC060,123,3,I
FIELD,CODE061,124,7,I
FIELD,CONC061,125,5,I
FIELD,CODE062,126,7,I
FIELD,CONC062,127,3,I
FIELD,CODE063,128,7,I
FIELD,CONC063,129,5,I
FIELD,CODE064,130,7,I
FIELD,CONC064,131,3,I
FIELD,CODE065,132,7,I
FIELD,CONC065,133,5,I
FIELD,CODE066,134,7,I
FIELD,CONC066,135,3,I
FIELD,CODE067,136,7,I
FIELD,CONC067,137,5,I
FIELD,CODE068,138,7,I
FIELD,CONC068,139,3,I
FIELD,CODE069,140,7,I
FIELD,CONC069,141,3,I
FIELD,CODE070,142,7,I
FIELD,CONC070,143,3,I
FIELD,CODE071,144,7,I
FIELD,CONC071,145,3,I
FIELD,CODE072,146,7,I
FIELD,CONC072,147,3,I
FIELD,CODE073,148,7,I
FIELD,CONC073,149,3,I
FIELD,CODE074,150,7,I
FIELD,CONC074,151,3,I
FIELD,CODE075,152,7,I
FIELD,CONC075,153,3,I
FIELD,CODE076,154,7,I
FIELD,CONC076,155,3,I
FIELD,CODE077,156,7,I
FIELD,CONC077,157,5,I
FIELD,CODE078,158,7,I
FIELD,CONC078,159,3,I
FIELD,CODE079,160,7,I
FIELD,CONC079,161,3,I
FIELD,CODE080,162,7,I
FIELD,CONC080,163,3,I
FIELD,CODE081,164,7,I
FIELD,CONC081,165,5,I
FIELD,CODE082,166,7,I
FIELD,CONC082,167,3,I
FIELD,CODE083,168,7,I
FIELD,CONC083,169,3,I
FIELD,CODE084,170,7,I
FIELD,CONC084,171,3,I
FIELD,CODE085,172,7,I
FIELD,CONC085,173,3,I
FIELD,CODE086,174,7,I
FIELD,CONC086,175,3,I
```

```
FIELD,CODE087,176,7,I
FIELD,CONC087,177,3,I
FIELD,CODE088,178,7,I
FIELD,CONC088,179,3,I
FIELD,CODE089,180,7,I
FIELD,CONC089,181,3,I
FIELD,CODE090,182,7,I
FIELD,CONC090,183,3,I
FIELD,CODE091,184,7,I
FIELD,CONC091,185,3,I
FIELD,CODE092,186,7,I
FIELD,CONC092,187,3,I
FIELD,CODE093,188,7,I
FIELD,CONC093,189,3,I
FIELD,CODE094,190,7,I
FIELD,CONC094,191,3,I
FIELD,CODE095,192,7,I
FIELD,CONC095,193,3,I
FIELD,CODE096,194,7,I
FIELD,CONC096,195,3,I
FIELD,CODE097,196,7,I
FIELD,CONC097,197,3,I
FIELD,CODE098,198,7,I
FIELD,CONC098,199,3,I
FIELD,CODE099,200,7,I
FIELD,CONC099,201,3,I
FIELD,CODE100,202,7,I
FIELD,CONC100,203,3,I
FIELD,CODE101,204,7,I
FIELD,CONC101,205,3,I
FIELD,CODE102,206,7,I
FIELD,CONC102,207,3,I
FIELD,CODE103,208,7,I
FIELD,CONC103,209,3,I
FIELD,CODE104,210,7,I
FIELD,CONC104,211,3,I
FIELD,CODE105,212,7,I
FIELD,CONC105,213,3,I
FIELD,CODE106,214,7,I
FIELD,CONC106,215,3,I
FIELD,CODE107,216,7,I
FIELD,CONC107,217,3,I
FIELD,CODE108,218,7,I
FIELD,CONC108,219,3,I
FIELD,CODE109,220,7,I
FIELD,CONC109,221,3,I
FIELD,CODE110,222,7,I
FIELD,CONC110,223,3,I
FIELD,CODE111,224,7,I
FIELD,CONC111,225,3,I
FIELD,CODE112,226,7,I
FIELD,CONC112,227,3,I
FIELD,CODE113,228,7,I
FIELD,CONC113,229,3,I
FIELD,CODE114,230,7,I
FIELD,CONC114,231,3,I
FIELD,CODE115,232,7,I
FIELD,CONC115,233,3,I
FIELD,CODE116,234,7,I
FIELD,CONC116,235,3,I
FIELD,CODE117,236,7,I
FIELD,CONC117,237,3,I
FIELD,CODE118,238,7,I
FIELD,CONC118,239,3,I
FIELD,CODE119,240,7,I
FIELD,CONC119,241,3,I
FIELD,CODE120,242,7,I
FIELD,CONC120,243,3,I
FIELD,CODE121,244,7,I
FIELD,CONC121,245,3,I
FIELD,CODE122,246,7,I
FIELD,CONC122,247,3,I
FIELD,CODE123,248,7,I
FIELD,CONC123,249,3,I
FIELD,CODE124,250,7,I
FIELD,CONC124,251,3,I
FIELD,CODE125,252,7,I
FIELD,CONC125,253,3,I
FIELD,CODE126,254,7,I
FIELD,CONC126,255,3,I
FIELD,CODE127,256,7,I
FIELD,CONC127,257,3,I
FIELD,CODE128,258,7,I
FIELD,CONC128,259,3,I
FIELD,CODE129,260,7,I
FIELD,CONC129,261,3,I
**
```

```
*****************************************************************************
*     CO BAG SAMPLES RECORD DEFINITION                                      *
*****************************************************************************
RECORD,COBAGS,5,1,/22,2
FORMAT(A2,2A6,A2,I2)
FIELD,TYPE,01,2,A
FIELD,TIME,02,6,A
FIELD,DATE,03,6,A
FIELD,SITE,04,2,A
FIELD,CO  ,05,2,I
*****************************************************************************
*     CALTRANS VAN DATA RECORD DEFINITION                                   *
*****************************************************************************
RECORD,CTVAN,11,1,/23,2
FORMAT(A2,2A6,A2,F2.1,I5,I2,4F3.1)
FIELD,TYPE,01,2,A
FIELD,TIME,02,6,A
FIELD,DATE,03,6,A
FIELD,SITE,04,2,A
FIELD,WS  ,05,2,R
FIELD,WD  ,06,3,I
FIELD,CO  ,07,2,I
FIELD,O3  ,08,3,R
FIELD,NO  ,09,3,R
FIELD,NO2 ,10,3,R
FIELD,NOX ,11,3,R
*****************************************************************************
*     RADIOSONDE RECORD DEFINITION                                          *
*****************************************************************************
RECORD,RSONDE,20,1,/24,2
FORMAT(A2,2A6,A2,4(I4,F3.1,F5.1,I4))
FIELD,TYPE,01,2,A
FIELD,TIME,02,6,A
FIELD,DATE,03,6,A
FIELD,SITE,04,2,A
FIELD,MH1  ,05,4,I
FIELD,TEMP1,06,5,R
FIELD,DWPT1,07,5,R
FIELD,ALT1 ,08,4,I
FIELD,MH2  ,09,4,I
FIELD,TEMP2,10,3,R
FIELD,DWPT2,11,5,R
FIELD,ALT2 ,12,4,I
FIELD,MH3  ,13,4,I
FIELD,TEMP3,14,5,R
FIELD,DWPT3,15,5,R
FIELD,ALT3 ,16,4,I
FIELD,MH4  ,17,4,I
FIELD,TEMP4,18,5,R
FIELD,DWPT4,19,5,R
FIELD,ALT4 ,20,4,I
*****************************************************************************
*     WINDS ALOFT-1 RECORD DEFINITION                                       *
*****************************************************************************
RECORD,WNDS1,12,1,/25,2
FORMAT(A2,2A6,A5,A4,A2,F4.1,I3,I5,F5.1,2I3)
FIELD,TYPE,01,2,A
FIELD,TIME,02,6,A
FIELD,DATE,03,6,A
FIELD,SITE  ,04,5,A
FIELD,GMDATE,05,4,A
FIELD,GMT   ,06,2,A
FIELD,TEMP  ,07,4,R
FIELD,HELM  ,08,5,I
FIELD,HEIGHT,09,5,I
FIELD,MB    ,10,5,R
FIELD,WD    ,11,3,I
FIELD,WS    ,12,3,I
**
```

```
*****************************************************************************
*     WINDS ALOFT-2 RECORD DEFINITION                                       *
*****************************************************************************
RECORD,WNDS2,54,1,/26,2
FORMAT(A2,2A6,A5,A4,A2,8(2I4,F4.1,I2,I3,I2))
FIELD,TYPE,01,2,A
FIELD,TIME,02,6,A
FIELD,DATE,03,6,A
FIELD,SITE,04,5,A
FIELD,GDATE,05,4,A
FIELD,GMT  ,06,2,A
FIELD,MB1  ,07,4,I
FIELD,ALT1 ,08,4,I
FIELD,TEMP1,09,4,R
FIELD,RELM1,10,4,I
FIELD,WD1  ,11,3,I
FIELD,WS1  ,12,2,I
FIELD,MB2  ,13,4,I
FIELD,ALT2 ,14,4,I
FIELD,TEMP2,15,4,R
FIELD,RELM2,16,4,I
FIELD,WD2  ,17,3,I
FIELD,WS2  ,18,2,I
FIELD,MB3  ,19,4,I
FIELD,ALT3 ,20,4,I
FIELD,TEMP3,21,4,R
FIELD,RELM3,22,4,I
FIELD,WD3  ,23,3,I
FIELD,WS3  ,24,2,I
FIELD,MB4  ,25,4,I
FIELD,ALT4 ,26,4,I
FIELD,TEMP4,27,4,R
FIELD,RELM4,28,4,I
FIELD,WD4  ,29,3,I
FIELD,WS4  ,30,2,I
FIELD,MB5  ,31,4,I
FIELD,ALT5 ,32,4,I
FIELD,TEMP5,33,4,R
FIELD,RELM5,34,4,I
FIELD,WD5  ,35,3,I
FIELD,WS5  ,36,2,I
FIELD,MB6  ,37,4,I
FIELD,ALT6 ,38,4,I
FIELD,TEMP6,39,4,R
FIELD,RELM6,40,4,I
FIELD,WD6  ,41,3,I
FIELD,WS6  ,42,2,I
FIELD,MB7  ,43,4,I
FIELD,ALT7 ,44,4,I
FIELD,TEMP7,45,4,R
FIELD,RELM7,46,4,I
FIELD,WD7  ,47,3,I
FIELD,WS7  ,48,2,I
FIELD,MB8  ,49,4,I
FIELD,ALT8 ,50,4,I
FIELD,TEMP8,51,4,R
FIELD,RELM8,52,4,I
FIELD,WD8  ,53,3,I
FIELD,WS8  ,54,2,I
**
```

APPENDIX II

PROGRAM LISTING

```
      PROGRAM MEPLEVY
      INTEGER IN(10),NAMES(20,,LIMS(20),FILE(3),RECORD(8,30),FMTS(8,30),
     1   FIELDS(5,1100),SELECT(6,50),FORMATS(3),TABS(8,50),
     2    FMT(9),TC,TSP,TLEN,TLINE(14),THEAD(14),TP,TL,TPOS,WK(3)
     3    ,TUNITS(10),HOF(14),LABEL(3),OPNAM,WORK(512)
     4   ,PSYM,PLOC    ,PLOT(7,50),PUNITS(10),PPOS,PPGLN(2,10)
      REAL SCALES(2,10)
      COMMON/A/KARD(8),OPNAM(3),IRD
      COMMON//INP(150),IDEC(300)
      LOGICAL IRES,LTEMP
      LOGICAL EOF,EXEC
      INTEGER ERR,COPY(20),SWITCH(4,20),COMPUTE(20)
      INTEGER HEADING(15,20)
      DATA NAMES/4HFILE,6HRECORD,5HFIELD,6HSELECT,8HTABULATE,
     1    5HSCALE,4HPLOT,4HCOPY,6HDEFINE,7HCOMPUTE,7HHEADING/
      DATA    LIMS/1,50,1100,50,50,10,50,20,20,20,20/
      DATA FORMATS/5H(I10),5H(F10),4H(A8)/
      DATA    I34,K34/3H34,,2H34/
C
C     THE FOLLOWING LOGICAL UNITS ARE RESERVED FOR USE BY THE
C     RETRIEVAL SYSTEM.  ALL OTHER UNITS WITHIN THE ALLOWABLE RANGE ARE
C     AVAILABLE TO THE USER.
C
C         LUN         USAGE
C     ---------------------------------
C
C           5    PARAMETER INPUT CARDS
C           6    PRINTED OUTPUT LISTINGS
C        7-16    TEMPORARY TABULATION FILES
C       17-26    TEMPORARY PLOT FILES
C
      IR=NF=IS=ISG=ITG=IT=NS=MAXF=0
      EOF=.FALSE.
      EXEC=.FALSE.
      IRES=.FALSE.
      LTEMP=.FALSE.
      IFIL=0
      ICPY=0
      CALL XMIT(-300,1H ,HEADING(1,1))
C
C     READ NAME OF DESIRED OPERATION, THIS WILL BE USED LATER ON TO SEARCH
C     THE TAPE FOR THE DESIRED OPERATION.
C
      IRD = 0
      READ (5,233) OPNAM
  233 FORMAT (3A10)
      IF(OPNAM(2).EQ.K34)   OPNAM(2)  = I34
C
    1 CALL RD(IN,EOF)
      IF(EOF) 1000,2
    2 CONTINUE
      IRD = IRD + 1
      DO 3 I = 1,20
      IF(IN(1).EQ.NAMES(I)) GO TO 4
    3 CONTINUE
      PRINT 200
  200 FORMAT(*0ILLEGAL DIRECTIVE NAME ENCOUNTERED.  WILL BE IGNORED*)
      ERR=ERR+1
      GO TO 1
    4 IF(I.GT.3) EXEC=.TRUE.
```

```
      IF(I.GT.3.OR..NOT.EXEC) GO TO 10004
      PRINT 227
  227 FORMAT(* ALL DECLARATIVES MUST PRECEDE THE OTHER STATEMENT TYPES*)
      ERR=ERR+1
10004 GO TO (5,6,11,12,10021,30,35,80,81,85,86) I
 9000 PRINT 9001
 9001 FORMAT(*0STORAGE EXCEEDED FOR THIS STATEMENT TYPE, RECOMPILE.*)
      ERR=ERR+1
      GO TO 1
C
C     FILE STATEMENT PROCESSOR
C
    5 DECODE(5,101,IN(2)) FILE(1)
      FILE(2)=8
      IF(IN(5),EQ,3HBCD) FILE(2)=0
      IF(IN(3),EQ,3HBIN) FILE(2)=1
      DECODE(5,101,IN(4)) FILE(3)
      FILE(5)=(FILE(3)+9)/10
  101 FORMAT(2X,I8)
      IFIL=1
      IF(FILE(2),NE,8) GO TO 1
      PRINT 215
  215 FORMAT(*0ILLEGAL MODE SPECIFIED, NOT BCD OR BIN*)
      ERR=ERR+1
      GO TO 1
C
C     RECORD STATEMENT PROCESSOR
C
    6 IR=IR+1
      IF(IR,GT,LIMS(I)) GO TO 9000
      RECORD(1,IR)=IN(2)
      DECODE(5,101,IN(3)) RECORD(2,IR)
      DECODE(5,101,IN(4)) RECORD(3,IR)
      RECORD(4,IR)=IN(5)
      DECODE(5,101,IN(6))RECORD(5,IR)
      CALL XMIT(-3,0,RECORD(6,IR))
      IF(RECORD(2,IR),GT,MAXF) MAXF=RECORD(2,IR)
      IF(IN(7),EQ,1H ) GO TO 10
      DECODE(10,101,IN(7)) RECORD(6,IR)
      RECORD(7,IR)=IN(8)
      DECODE(10,101,IN(9)) RECORD(8,IR)
   10 CALL RD(IN,EOF)
      IF(EOF) 7,8
    7 PRINT 201
  201 FORMAT(*0PREMATURE EOF ENCOUNTERED, JOB ABORTED*)
      CALL EXIT
    8 IF(COMP(KARD,1,6HFORMAT,1,6),EQ,0) GO TO 9
      PRINT 202
  202 FORMAT(* MISSING RECORD FORMAT SPECIFICATION*)
      ERR=ERR+1
      GO TO 2
    9 CALL MCHAR(7,KARD,1,FMTS(1,IR),74)
      GO TO 1
C
C     FIELD STATEMENT PROCESSOR
C
   11 NF=NF+1
      IF(NF,GT,LIMS(I)) GO TO 9000
      LF=NF
      FIELDS(1,NF)=IR
```

```
      FIELDS(2,NF)=IN(2)
      DECODE(10,101,IN(3)) FIELDS(3,NF)
      DECODE(10,101,IN(4)) FIELDS(4,NF)
      FIELDS(5,NF)=8
      IF(IN(5).EQ.1HI) FIELDS(5,NF)=0
      IF(IN(5).EQ.1HR) FIELDS(5,NF)=1
      IF(IN(5).EQ.1HA) FIELDS(5,NF)=2
      IF(IN(5).EQ.1HB) FIELDS(5,NF)=3
      IF(FIELDS(5,NF).NE.8) GO TO 1
      PRINT 216
  216 FORMAT(*0IMPROPER DATA MODE.  SHOULD BE I,R, OR A*)
      ERR=ERR+1
      GO TO 1
C
C     SELECT STATEMENT PROCESSOR
C
   12 IS=IS+1
      IF(IS.GT.LIMS(I)) GO TO 9000
      ISG=ISG+1
      LEV=0
      IF(IN(2).NE.1H ) GO TO 13
      PRINT 203
  203 FORMAT(* FIRST SELECT IN GROUP MUST HAVE A RECORD NAME*)
10012 ERR=ERR+1
      IS=IS-1
      ISG=ISG-1
      GO TO 1
10013 IS=IS+1
      IF(IS.GT.LIMS(I)) GO TO 9000
   13 DO 14 JR=1,IN
      IF(IN(2).EQ.RECORD(1,JR)) GO TO 15
   14 CONTINUE
      PRINT 204
  204 FORMAT(* UNKNOWN RECORD NAME*)
      GO TO 10012
   15 LEV=LEV+1
   16 SELECT(1,IS)=ISG
      SELECT(2,IS)=LEV
      SELECT(3,IS)=0
      SELECT(4,IS)=JR
      SELECT(6,IS)=0
      IF(IN(3).EQ.1H ) GO TO 10019
   17 DO 18 JF=1,NF
      IF(JF.LE.LF.AND.FIELDS(1,JF).NE.JR) GO TO 18
      IF(FIELDS(2,JF).EQ.IN(3)) GO TO 19
   18 CONTINUE
      PRINT 205,IN(3)
  205 FORMAT(* UNKNOWN FIELD NAME=*A10)
      ERR=ERR+1
      IS=IS-1
      IF(IN(2).NE.1H ) LEV=LEV-1
      GO TO 1
   19 IS=IS+1
      IF(IS.GT.LIMS(I)) GO TO 9000
      SELECT(1,IS)=ISG
      SELECT(2,IS)=LEV
      SELECT(3,IS)=FIELDS(3,JF)
      MODE=FIELDS(5,JF)+1
      IF(MODE.EQ.8) GO TO 51
      IFMT=FORMATS(MODE)
```

```
      IF(IN(5),EQ,1H ) IN(5)=IN(4)
      DECODE(6,IFMT,IN(4)) SELECT(4,IS)
      DECODE(6,IFMT,IN(5)) SELECT(5,IS)
   50 SELECT(6,IS)=MODE+1
10019 CALL RD(IN,EOF)
      IF(EOF) 7,20
   20 IF(IN(1),NE,6HSELECT) GO TO 2
      IF(IN(2),NE,1H ) GO TO 10013
      IF(IN(3),EQ,1H ) GO TO 19
      GO TO 17
   51 DECODE(10,101,IN(4)) SELECT(4,IS)
      SELECT(5,IS)=8
      IF(IN(5),EQ,4HTRUE) SELECT(5,IS)=1
      IF(IN(5),EQ,5HFALSE) SELECT(5,IS)=0
      IF(SELECT(5,IS),NE,8) GO TO 50
      PRINT 223
  223 FORMAT(* ILLEGAL SELECT FORMAT FOR BINARY FIELD*)
      ERR=ERR+1
      IS=IS-1
      GO TO 10019
C
C     TABULATE STATEMENT PROCESSOR
C
10021 IF(ISG,EQ,0) ISG=1
      TUNITS(ISG)=ISG+6
      ITL=0
   21 IRTST=0
      DO 27 LR=1,IR
      IF(IN(2),NE,RECORD(1,LR)) GO TO 27
      IRTST=1
      GO TO 28
   27 CONTINUE
   28 KK=IRTST+2
      DO 24 K=KK,10,2
      IF(IN(K),EQ,1H ) GO TO 25
      DO 22 JF=1,NF
      IF(IRTST,EQ,1,AND,FIELDS(1,JF),NE,LR) GO TO 22
      IF(FIELDS(2,JF),EQ,IN(K)) GO TO 23
   22 CONTINUE
      PRINT 205,IN(K)
      ERR=ERR+1
      GO TO 24
   23 IT=IT+1
      IF(FIELDS(5,JF),NE,3) GO TO 52
      PRINT 224,IN(K)
  224 FORMAT(* BINARY FIELD *A8* CANT BE TABULATED*)
      ERR=ERR+1
      IT=IT-1
      GO TO 24
   52 IF(IT,GT,LIMS(I)) GO TO 9000
      IF(IN(K+1),NE,1H ) GO TO 29
      PRINT 221
  221 FORMAT(* MISSING OUTPUT FORMAT SPECIFICATION*)
      ERR=ERR+1
      IT=IT+1
      GO TO 25
   29 TABS(1,IT)=ISG
      TABS(2,IT)=IN(K)
      TABS(3,IT)=FIELDS(4,JF)
      TABS(4,IT)=10H(         )
```

```
      CALL MCHAR(1,IN(K+1),2,TABS(4,IT),8)
      TABS(5,IT)=TABS(6,IT)*8
      TABS(7,IT)=FIELDS(3,JF)
      TABS(8,IT)=FIELDS(1,JF).OR.MSHIFT(IRTST,-1)
      ITL=ITL+TABS(3,IT)+3
      IF(ITL.LT.136) GO TO 24
      PRINT 214,IN(K)
  214 FORMAT(* TAB LENGTH EXCEEDS 136 CHARACTERS, OVERFLOW FIELD=*A10)
      IT=IT-1
      GO TO 25
   24 CONTINUE
   25 CALL RD(IN,EOF)
      IF(EOF) 1000,26
   26 IF(IN(1).NE.8HTABULATE) GO TO 2
      GO TO 21
C
C     SCALE STATEMENT PROCESSOR
C
   30 IF(ISG.EQ.0) ISG=1
      DECODE(10,102,IN(2)) SCALES(1,ISG)
      DECODE(10,102,IN(3)) SCALES(2,ISG)
  102 FORMAT(2X,F8)
      GO TO 1
C
C     PLOT STATEMENT PROCESSOR
C
   35 IF(ISG.EQ.0) ISG=1
      PUNITS(ISG) = ISG+16
      PPGLN(1,ISG) = 0
      PPGLN(2,ISG) = 66
      TPL = 105
   36 IRTST = 0
      DO 37 LR=1,IR
      IF(IN(2).NE.RECORD(1,LR)) GO TO 37
      IRTST=1
      GO TO 38
   37 CONTINUE
   38 KK=IRTST+2
      DO 41 K=KK,10,2
      IF(IN(K).EQ.1H ) GO TO 42
      DO 39 JF=1,NF
      IF(IRTST.EQ.1.AND.FIELDS(1,JF).NE.LR) GO TO 39
      IF(FIELDS(2,JF).EQ.IN(K)) GO TO 40
   39 CONTINUE
      PRINT 205,IN(K)
      ERR=ERR+1
      GO TO 41
   40 IP=IP+1
      IF(IP.GT.LIMS(I)) GO TO 9000
      IF(FIELDS(5,JF).EQ.2.OR.IN(K+1).NE.1H ) GO TO 44
      PRINT 222
  222 FORMAT(* PLOT SYMBOLS SHOULD BE NON-BLANK CHARACTERS*)
      ERR=ERR+1
      IP=IP+1
      GO TO 42
   44 PLOT(1,IP)=ISG
      IF(FIELDS(5,JF).NE.3) GO TO 53
      PRINT 225,IN(K)
  225 FORMAT(* BINARY FIELD *A8* CANT BE PLOTTED*)
      ERR=ERR+1
```

```
      IP=IP+1
      GO TO 41
   53 PLOT(2,IP)=IN(K)
      PLOT(3,IP)=FIELDS(3,JF)
      PLOT(4,IP)=FIELDS(4,JF)
      PLOT(5,IP)=FIELDS(5,JF)
      PLOT(6,IP)=FIELDS(1,JF).OR.MSHIFT(IRTST,-1)
      PLOT(7,IP)=IN(K+1)
      IF(PLOT(5,IP).EQ.2) IPL=IPL+PLOT(6,IP)+3
      IF(IPL.LT.136) GO TO 41
      PRINT 217,IN(K)
  217 FORMAT(' PLOT LENGTH EXCEEDS 136 CHARACTERS, OVERFLOW FIELD='A10)
      IP=IP+1
      GO TO 42
   41 CONTINUE
   42 CALL RD(IN,EOF)
      IF(EOF) 1000,43
   43 IF(IN(1).NE.4HPLOT) GO TO 2
      GO TO 36
C
C     COPY STATEMENT PROCESSOR
C
   80 IF(ISG.EQ.0) ISG=1
      DECODE(10,101,IN(2)) COPY(ISG)
      IF(COPY(ISG).NE.0) GO TO 1
      PRINT 226
  226 FORMAT(' MISSING LOGICAL UNIT ON COPY STATEMENT')
      ERR=ERR+1
      GO TO 1
C
C     DEFINE STATEMENT PROCESSOR
C
   81 IF(ISG.EQ.0) ISG=1
      NS=NS+1
      IF(NS.GT.LIMS(1)) GO TO 9000
      SWITCH(1,NS)=ISG
      SWITCH(2,NS)=IN(2)
      SWITCH(3,NS)=IN(3)
      JF=LF+1
      IF(LF.EQ.NF) GO TO 83
      DO 82 JF=JF,NF
      IF(FIELDS(2,JF).NE.IN(2)) GO TO 82
      SWITCH(4,NS)=FIELDS(3,JF)
      GO TO 1
   82 CONTINUE
   83 NF=NF+1
      IF(NF.LE.LIMS(3)) GO TO 84
      PRINT 228
  228 FORMAT(' DEFINE SPACE EXCEEDED, RECOMPILE')
      ERR=ERR+1
      NF=NF-1
      GO TO 1
   84 MAXF=MAXF+1
      FIELDS(1,NF)=0
      FIELDS(2,NF)=IN(2)
      FIELDS(3,NF)=MAXF
      FIELDS(4,NF)=10
      FIELDS(5,NF)=2
      SWITCH(4,NS)=MAXF
      IDEC(MAXF)=1H
```

```
      GO TO 1
C
C     COMPUTE STATEMENT PROCESSOR
C
   85 IF(ISG.EQ.0) ISG=1
      COMPUTE(ISG)=IN(2)
      GO TO 1
C
C     HEADING STATEMENT PROCESSOR
C
   86 IF(IN(2).EQ.1HL.OR.IN(2).EQ.1HR) GO TO 87
      PRINT 229
  229 FORMAT(* FIRST PARAMETER MUST BE L OR R*)
      ERR=ERR+1
      GO TO 1
   87 IF(IN(2).EQ.1HL) NH=NH+1
      IF(NH.GT.LIMS(I)) GO TO 9000
      IF(ISG.EQ.0) ISG=1
      IWK=IH
      ICT=0
      IND=1
      DO 88 LH=1,80
      CALL MCHAR(LH,KARD,1,IWK,1)
      IF(IWK.NE.1H,) GO TO 88
      ICT=ICT+1
      IF(ICT.EQ.2) GO TO 89
   88 CONTINUE
      PRINT 230
  230 FORMAT(* IMPROPER FORMAT FOR HEADING*)
      ERR=ERR+1
      NH=NH-1
      GO TO 1
   89 LENH=80-LH
      IF(LENH.GT.68) LENH=68
      LH=LH+1
      IF(IN(2).EQ.1HR) IND=69
      CALL MCHAR(LH,KARD,IND,HEADING(2,NH),LENH)
      HEADING(1,NH)=ISG
      GO TO 1
C
C     BEGIN THE FILE PROCESSING USING
C     THE VALUES STORED INTO TABLES,
C     ORDER IS--- READ,SELECT,TABULATE
C
C
 1000 IF(IFIL.EQ.1) GO TO 1002
      PRINT 206
  206 FORMAT(* NF---MISSING FILE DECLARATION*)
      ERR=ERR+1
 1002 IF(IR.NE.0) GO TO 1003
      PRINT 207
  207 FORMAT(* RF---MISSING RECORD DECLARATION*)
      ERR=ERR+1
 1003 IF(NF.NE.0) GO TO 1004
      PRINT 208
  208 FORMAT(* FF--NO FIELD DECLARATIONS SPECIFIED*)
      ERR=ERR+1
 1004 IF(ERR.EQ.0) GO TO 1005
      PRINT 209,ERR
  209 FORMAT(*0*I4* ERRORS IN THE ABOVE SET OF PARAMETERS,*
```

```
     1    *  EXECUTION HAS BEEN INHIBITED*)
      CALL EXIT
C
C     BEGIN EXECUTION
C
C
 1005 LUN=FILE(1)
      MODE=FILE(2)
      LENT=FILE(3)*10
      LLEN=FILE(5)
      PRINT 1006
 1006 FORMAT(*Z*)
C
C     READ OPERATION LABEL ON THE TAPE AND COMPARE WITH INPUT LABEL.
C     SEARCH THE TAPE IF INPUT LABEL AND TAPE LABEL DO NOT MATCH.
C     SEARCH WILL CONTINUE UNTIL THE DESIRED OPERATION IS FOUND OR UNTIL
C     TAPE IS EXHAUSTED.
C
 1103 IPAR = 0
 1104 BUFFER IN(LUN,0) (LABEL(1),LABEL(3))
 1105 IF(UNIT,LUN) 1105,1108,1107,1106
 1106 IPAR = IPAR + 1
      BACKSPACE LUN
      IF(IPAR.LE.10) GO TO 1104
      PRINT 234
      CALL EXIT
  234 FORMAT (1H0,5X,*PARITY ERROR ON INPUT TAPE, OPERATION LABEL *,
     1    *COULD NOT BE READ IN TEN TRIES, JOB ABORTED, TRY AGAIN.*)
C
 1107 CONTINUE
      PRINT 235, OPNAM
  235 FORMAT(1H0,5X,3A10,* NOT FOUND ON THIS TAPE, PLEASE CHECK*/30X,
     1    *(1) FORMAT OF INPUT CARD     AND/OR*/36X,
     2    *(2) TAPE CONTENTS,*/36X,* JOB ABORTED, TRY AGAIN.*)
      CALL EXIT
C
C     COMPARE TAPE LABEL WITH LABEL INPUT ON CARD.
C
 1108 CONTINUE
      IF(LABEL(2).EQ.OPNAM(2)) GO TO 1007
      PRINT 236, OPNAM
  236 FORMAT (1H0,5X,*SEARCHING FOR *,3A10,* WILL TRY NEXT FILE*)
      CALL SKPFILE(LUN)
      GO TO 1105
C
 1007 II = 10H
      CALL XMIT(-512,II,WORK)
      BUFFER IN(LUN,MODE) (WORK(1),WORK(512))
 1008 IF(UNIT,LUN) 1008,1009,1025,1030
 1009 IOK = 0
 1010 CALL XMIT(-LLEN,1H ,INP(1))
      CALL RECRD(WORK,INP,IOK,IGO,NWD)
      IF(IGO.EQ.0) GO TO 1007
C
C     CLASSIFY RECORD TYPE
C
 1012 DO 1013 K=1,IK
      IF(COMP(INP,RECORD(3,K),RECORD(4,K),1,RECORD(5,K)),NE,0)GO TO 1013
      IF(RECORD(6,K),EQ,0) GO TO 1014
      IF(COMP(INP,RECORD(6,K),RECORD(7,K),1,RECORD(8,K)),EQ,0)GO TO 1014
```

```
 1013 CONTINUE
      GO TO 1010
C
C     DECODE RECORD
C
 1014 CALL XMIT(8,FMTS(1,K),FMT)
      KR=K
      NUMF=RECORD(2,K)
      DECODE(LENT,FMT,INP)(IDEC(L),L=1,NUMF)
C
C     SEE IF ITS NEEDED
C
 1015 KG=1
      KS=1
      IF(IS.EQ.0.OR.SELECT(1,1).GT.1) GO TO 2000
 1016 IF(SELECT(3,KS).EQ.0.AND.SELECT(4,KS).EQ.KR) GO TO 1018
      KS=KS+1
 1017 IF(KS.GT.IS) 1010,1016
 1018 IRES=.TRUE.
      KG=SELECT(1,KS)
      KL=SELECT(2,KS)
      LTEMP=.TRUE.
 1019 KS=KS+1
      IF(KS.GT.IS) GO TO 1020
      IF(SELECT(1,KS).EQ.KG.AND.SELECT(2,KS).EQ.KL) GO TO 1021
 1020 IF(IRES.AND.LTEMP) 2000,1017
C
C     DO SELECT COMPARES
C
 1021 KF= SELECT(3,KS)
      KM= SELECT(6,KS)+1
      GO TO (1022,1023,1024,1040) KM
 1022 IF(IDEC(KF).LT.SELECT(4,KS).OR.IDEC(KF).GT.SELECT(5,KS)) LTEMP=.F.
      GO TO 1019
 1023 CALL XMIT(1,IDEC(KF),A)
      CALL XMIT(1,SELECT(4,KS),B)
      CALL XMIT(1,SELECT(5,KS),C)
      IF(A.LT.B.OR.A.GT.C) LTEMP=.F.
      GO TO 1019
 1024 IF(COMP(IDEC(KF),1,SELECT(4,KS),1,10).LT.0.OR.
     1    COMP(IDEC(KF),1,SELECT(5,KS),1,10).GT.0) LTEMP=.F.
      GO TO 1019
 1025 DO 1031 I=1,10
      IF(ICPY.EQ.0) KLUN=TUNITS(I)
      IF(ICPY.EQ.1) KLUN=PUNITS(I)
      IF(KLUN.EQ.0) GO TO 1031
      REWIND KLUN
 1026 BUFFER IN(KLUN,0)(BUF(1),BUF(14))
 1027 IF(UNIT,KLUN) 1027,1028,1031
 1028 LEN=LENGTH(KLUN)
      BUFFER OUT(6,0)(BUF(1),BUF(LEN))
 1029 IF(UNIT,6) 1029,1026
 1031 CONTINUE
      IF(ICPY.EQ.1) CALL EXIT
      ICPY=1
      GO TO 1025
 1040 IWD=KF+(SELECT(4,KS)+59)/60-1
      IBIT=SELECT(4,KS)-(IWD-KF)*60-1
      IF(MSHIFT(IDEC(IWD),IBIT).GE.0) LTEMP=.FALSE.
      GO TO 1019
```

```
C
C     PARITY ERROR
C
 1030 IPERR=IPERR+1
      IF(IPERR.GE.50) CALL EXIT
      PRINT 210
      PRINT 211, WORK
  210 FORMAT(*0PARITY ERROR ON INPUT FILE, DATA BELOW WERE IGNORED.*)
  211 FORMAT(1H0,5X,5020)
      GO TO 1007
C
C     RECORD HAS BEEN SELECTED FOR
C     FURTHER PROCESSING
C
 2000 IRES=.FALSE.
      LTEMP=.FALSE.
C
C     ---  SET ANY SWITCHES THAT HAVE BEEN SELECTED
C
      IF(NS.EQ.0) GO TO 2031
      DO 2030 JS=1,NS
      IF(SWITCH(1,JS).NE.KG) GO TO 2030
      JF=SWITCH(4,JS)
      IDEC(JF)=SWITCH(3,JS)
 2030 CONTINUE
C
C     EXIT FOR ANY COMPUTATIONS SELECTED
C
 2031 IF(COMPUTE(KG).NE.0) CALL PROCES(RECORD,KR,KG,COMPUTE(KG))
C
C     NOW, COPY ANY RECORDS SELECTED
C
      JLUN=COPY(KG)
      IF(JLUN.EQ.0) GO TO 2020
      LGTH=LENGTH(LUN)
      BUFFER OUT(JLUN,MODE)(INP(1),INP(LGTH))
 2019 IF(UNIT,JLUN) 2019,2020
C
C     NOW, TABULATE ANY SELECTED DATA
C
 2020 IF(IT.EQ.0) GO TO 2010
      DO 2001 J=1,IT
      IF(TABS(1,J).EQ.KG) GO TO 2002
 2001 CONTINUE
      GO TO 2010
 2002 K=J
      TC=TSP=TLEN=0
      KLUN=TUNITS(KG)
      DO 2003 K=K,IT
      IF(TABS(1,K).NE.KG) GO TO 2004
      TC=TC+1
      TLEN=TLEN+TABS(3,K)
 2003 CONTINUE
      K=IT+1
 2004 CALL XMIT(-14,1H ,THEAD)
      CALL XMIT(-14,1H ,TLINE)
      KBK=1
      TP=TABS(5,J)
      TL=TABS(6,J)
      TPOS=1
```

```
      DO 2005 KK=J,K
      IC=TABS(3,KK)+2
      CALL MCHAR(1,TABS(2,KK),TPOS,THEAD,IC)
      NO=TABS(7,KK)
      IFM=TABS(4,KK)
      KTR=TABS(8,KK),AND,77777B
      IF(TABS(8,KK),LT,0,AND,KTR,NE,KR) GO TO 2007
      ENCODE(20,IFM,WK) IDEC(NO)
      CALL MCHAR(1,WK,TPOS,TLINE,IC)
 2007 TPOS=TPOS+IC+1
 2005 CONTINUE
      IF(TP,NE,0,AND,TL,LE,60) GO TO 2006
      TABS(5,J)=TP=TP+1
      TABS(6,J)=TL=2
      WRITE (KLUN,212) TP,LABEL
  212 FORMAT(*1L A R P P  RETRIEVAL TABULATION  P A G E *I3,10X,3A10/)
      IHCT=0
      IF(NH,EQ,0) GO TO 2009
      DO 2008 JH=1,NH
      IF(HEADING(1,JH),NE,KG) GO TO 2008
      WRITE(KLUN,231)(HEADING(HH,JH),HH=2,15)
  231 FORMAT(1X,13A10,A6)
      TABS(6,J)=TL=TL+1
      IHCT=IHCT+1
 2008 CONTINUE
 2009 IF(IHCT,NE,0) GO TO 2006
      WRITE(KLUN,232) THEAD
  232 FORMAT(1X,13A10,A6/)
      TABS(6,J)=TL=TL+2
 2006 WRITE(KLUN,213) TLINE
  213 FORMAT(1X,13A10,A6)
      TABS(6,J)=TL=TL+1
C
C     PRODUCE ANY REQUESTED PLOTS
C
 2010 IF(IP,EQ,0) GO TO 1017
      DO 2011 J=1,IP
      IF(PLOT(1,J),EQ,KG) GO TO 2012
 2011 CONTINUE
      GO TO 1017
 2012 K=J
      IPL=0
      PPOS=3
      KLUN=PUNITS(KG)
      CALL XMIT(-14,1H ,THEAD)
      CALL XMIT(-14,1H ,TLINE)
      DO 2013 K=K,IP
      IF(PLOT(1,K),NE,KG) GO TO 2014
      IF(PLOT(5,K),NE,2) GO TO 2013
      TP=PLOT(3,K)
      TL=PLOT(4,K)
      CALL MCHAR(1,PLOT(2,K),PPOS,THEAD,TL+2)
      CALL MCHAR(1,IDEC(TP),PPOS,TLINE,TL)
      PPOS=PPOS+TL+3
 2013 CONTINUE
      K=IP+1
 2014 K=K-1
      CALL MCHAR(1,1H,,PPOS+1,TLINE,1)
      CALL MCHAR(1,1H,,PPOS+101,TLINE,1)
      TP=PPGLN(1,KG)
```

```
      TL=PPGLN(2,KG)
      DO 2015 KK=J,K
      IC=PLOT(4,KK)+2
      KTR=PLOT(6,KK).AND.77778
      NO=PLOT(5,KK)
      IF(PLOT(5,KK).EQ.2.OR.PLOT(6,KK).LT.0.AND.KTR.NE.KR) GO TO 2015
      IF(PLOT(5,KK).EQ.0) VAL=IDEC(NO)
      IF(PLOT(5,KK).EQ.1) CALL XMIT(1,IDEC(NO),VAL)
      PSYM=PLOT(7,KK)
      PLOC=(VAL-SCALES(1,KG))/(ABS(SCALES(2,KG)-SCALES(1,KG))/100.)+0.5
      IF(PLOC.LT.0) PLOC=-1
      IF(PLOC.GT.100) PLOC=101
      PLOC=PLOC+PPOS+1
      CALL MCHAR(1,PSYM,PLOC,TLINE,1)
 2015 CONTINUE
      IF(TP.NE.0.AND.TL.LE.60) GO TO 2018
      PPGLN(1,KG)=TP=PPGLN(1,KG)+1
      PPGLN(2,KG)=3
      PST=SCALES(1,KG)
      PIN=(SCALES(2,KG)-SCALES(1,KG))/10.
      DO 2016 L=1,11
      ENCODE(10,218,MK) PST
  218 FORMAT(F10.2)
      LPOS=PPOS+L*10-12
      CALL MCHAR(5,MK,LPOS,THEAD,6)
      PST=PST+PIN
 2016 CONTINUE
      WRITE(KLUN,219) TP,LABEL,THEAD
  219 FORMAT('1L A R P P   RETRIEVAL PLOT   P A G E '13,10X,3A10//1X,
     1    15A10,A6)
      CALL XMIT('14,1H ,THEAD)
      LPOS=PPOS+1
      MK='10H+....+....
      DO 2017 L=1,10
      CALL MCHAR(1,MK,LPOS,THEAD,10)
      LPOS=LPOS+10
 2017 CONTINUE
      CALL MCHAR(1,MK,LPOS,THEAD,1)
      WRITE(KLUN,220) THEAD
  220 FORMAT(1X,15A10,A6)
 2018 PPGLN(2,KG)=PPGLN(2,KG)+1
      WRITE(KLUN,220) TLINE
      GO TO 1017
      END
```

```
      SUBROUTINE RD(IN,EOF)
      INTEGER IN(10),INP(80),COL,FLD,CT,WK,FIN
      LOGICAL EOF,LSW
      COMMON/A/KARD(8),OPNAM(3),IRD
      DATA LINE/66/,IPG/0/,LSW/.TRUE./
      DATA LUN/5/
      EOF=.FALSE.
   90 READ(LUN,100) KARD
  100 FORMAT(8A10)
      IF(EOF,LUN) 1,2
    1 EOF=.TRUE.
      RETURN
    2 DECODE(80,110,KARD) INP
  110 FORMAT(80R1)
      IF(INP(1).EQ.1R*) GO TO 10
    3 CALL XMIT(-10,1H ,IN(1))
      COL=1
      FLD=1
    4 MODE=0
      CT=0
      WK=1H
      FIN=0
    5 IF(INP(COL).LT.1R0.OR.INP(COL).GT.1R9) GO TO 8
    6 WK=MSHIFT(WK,6).AND..NOT.77B.OR.INP(COL)
      CT=CT+6
    7 COL=COL+1
      IF(COL.LE.80) GO TO 5
      FIN=1
      GO TO 9
    8 IF(INP(COL).EQ.1R ) GO TO 7
      IF(INP(COL).EQ.1R..AND.MODE.EQ.0) GO TO 6
      IF(INP(COL).EQ.1R=.AND.MODE.EQ.0) GO TO 6
      IF(INP(COL).EQ.1R,) GO TO 9
      MODE=1
      IF(INP(COL).EQ.1R/.AND.CT.EQ.0) GO TO 7
      GO TO 6
    9 IF(MODE.EQ.1) WK=MSHIFT(WK,-CT)
      IN(FLD)=WK
      FLD=FLD+1
      COL=COL+1
      IF(FLD.LE.10.AND.FIN.NE.1) GO TO 4
      IF(IN(1).NE.6HNOLIST) GO TO 10
      LSW=.FALSE.
   10 IF(.NOT.LSW) GO TO 12
      IF(LINE.LT.60) GO TO 11
      IPG=IPG+1
      LINE=2
      PRINT 200,IPG
      IF(IRD.EQ.0) PRINT 210, OPNAM
  200 FORMAT(*1LARPP RETRIEVAL SYSTEM -- INPUT PARAMETERS   PAGE*I4/)
   11 PRINT 210,KARD
  210 FORMAT(10X,8A10)
      LINE=LINE+1
   12 IF(INP(1).EQ.1R*) GO TO 90
      IF(IN(1).EQ.4HLIST) LSW=.TRUE.
      IF(IN(1).EQ.4HLIST.OR.IN(1).EQ.6HNOLIST) GO TO 90
      IF(IN(1).NE.4HREAD) RETURN
      DECODE(10,120,IN(2)) LUN
  120 FORMAT(8X,I2)
      GO TO 90



      END
**
```

```
      SUBROUTINE PROCES(RECORD,K,KG,IFLAG)
      INTEGER RECORD(8,30)
      COMMON//INP(150),IDEC(300)
      RETURN
      END
$$
```

```
      SUBROUTINE RECRD(IW,INP,IOK,IGO,NW)
      DIMENSION     IW(1),INP(1)
C
      IGO = 0
      IF(IOK.GT.0) GO TO 100
C
      DECODE(3,1,IW) NW
    1 FORMAT(I3)
      IF(NW.EQ.0) RETURN
      NCH = 10*NW
      NWD = NCH
      CALL MCHAR(4,IW,1,INP,NCH)
      IOK = 1
      IGO = 1
      RETURN
C
  100 CONTINUE
      NCH = NCH + 3
      IF(NCH.GT.5120) RETURN
      CALL MCHAR(NCH+1,IW,1,IS,3)
      DECODE(3,1,IS) NW
      IF(NW.EQ.0) RETURN
      INDX = NCH + 4
      NWD = NW*10
      CALL MCHAR(INDX,IW,1,INP,NWD)
      NCH = NCH + NWD
      IGO = 1
      RETURN
      END
$$
```

```
      LOGICAL FUNCTION FLAG(NUM,CHAN)
      INTEGER CHAN,CHNAM(9,2),FLGTBA(3,66),FLGTBB(3,17)
      COMMON//INP(150),IDEC(300)
      DATA CHNAM/2HNO,3HNOX,4HBSCT,2HCO,4HTEMP,
     1     5HDEWPT,4HNMHC,3HCH4,2HO3,
     2     3HCH4,2HO3,2HNO,3HNOX,5HTUTHC,2HCO,3*0/
      DATA FLGTBA/1,0,9,2,9,9,3,18,9,5,27,1,6,28,1,7,29,1,8,30,1,9,31,1,
     1     10,32,1,11,33,1,12,34,9,13,43,9,14,52,9,15,61,9,16,70,1,
     2     17,71,1,18,72,1,19,73,1,21,74,1,22,75,1,24,76,1,25,77,1,
     3     26,78,1,27,79,9,28,88,1,29,89,1,30,90,1,31,91,1,32,92,9,
     4     33,101,9,34,110,9,35,119,9,36,128,9,37,137,9,38,146,9,
     5     39,155,1,40,156,1,42,157,9,43,166,9,44,175,9,45,184,9,
     6     47,193,9,48,202,9,50,211,9,51,220,9,52,229,9,54,238,1,
     7     55,239,9,57,248,1,58,249,1,59,250,1,113,251,9,115,260,9,
     8     116,269,9,118,278,9,119,287,1,120,288,1,123,289,9,147,298,1,
     9     148,299,9,151,308,1,165,309,1,166,310,1,169,311,1,177,312,1,
     +     178,313,9/
      DATA FLGTBB/1,0,7,2,7,7,4,14,7,6,21,1,7,22,1,8,23,1,9,24,1,
     1     10,25,7,11,32,7,12,39,7,13,46,1,14,47,1,15,48,7,16,55,1,
     2     17,56,1,18,57,1,19,58,1/
      IND=0
      FLAG=.FALSE.
      IF(IDEC(1).EQ.2H01.OR.IDEC(1).EQ.2H11) IND=1
      IF(IDEC(1).EQ.2H02.OR.IDEC(1).EQ.2H12) IND=2
      IF(IND.EQ.0) RETURN
      DO 1 I=1,9
      IF(CHNAM(I,IND).EQ.CHAN) GO TO 2
    1 CONTINUE
      RETURN
    2 GO TO (3,5) IND
    3 DO 4 J=1,66
      IF(FLGTBA(1,J).NE.NUM) GO TO 4
      IF(FLGTBA(3,J).EQ.1) I=1
      I=D=(FLGTBA(2,J)+I-1)/60
      IBIT=(FLGTBA(2,J)+I-1)-(I=D*60)
      IF(MSHIFT(INP(I=D+2),IBIT).LT.0) FLAG=.TRUE.
      RETURN
    4 CONTINUE
      RETURN
    5 DO 6 J=1,17
      IF(FLGTBB(1,J).NE.NUM) GO TO 6
      IF(FLGTBB(3,J).EQ.1) I=1
      I=D=(FLGTBB(2,J)+I-1)/60
      IBIT=(FLGTBB(2,J)+I-1)-(I=D*60)
      IF(MSHIFT(INP(I=D+2),IBIT).LT.0) FLAG=.TRUE.
      RETURN
    6 CONTINUE
      RETURN
      END
**
```

APPENDIX III

CORRECTION FACTORS FOR HELICOPTER DATA

The data for several species measured in the helicopters were adjusted to compensate for zero-drift from temperature effects and for the effect of the change of pressure due to altitude. In this appendix we list the formulae that were used to apply such corrections.

Zero-Drift Corrections (Operations 1-11)

It was determined that the zero drift of the NO, NO_x, hydrocarbon, CO, and O_3 instruments was essentially a function of the temperature. Linear regression equations were developed to obtain the zero drift and this quantity was subtracted from the uncorrected reading. The zero-drift correction was automated in the data acquisition system after Operation 11, hence these equations apply only to Operations 1-11.

The general form of the equation is

$$Z = aT + b$$

where Z = zero drift

T = ambient temperature in (^{o}F)

a,b = regression line coefficients.

The coefficients a and b are given below for each helicopter and species. The helicopter identification shown in Table III-1 is the one that appears in the archive tapes.

Table III-2 gives the temperature range for which each equation is applicable.

TABLE III-1

Coefficients of linear equations used to adjust zero-drift*

	Helicopter Identification			
	20		30	
Species	a	b	a	b
NO	4.58081245(-4)	-2.66048296(-2)	1.00594237(-3)	-7.79534964(-2)
NO_x	1.19410533(-3)	-5.48164544(-2)	1.58856516(-3)	-9.53598448(-2)
CO	0.42656878	-27.570730	0.1308215200	-8.3255988
NMHC	2.16974421(-2)	-1.1311372	1.89641157(-2)	-0.95885960
CH_4	-1.22475948(-3)	0.75678855	3.12694306(-2)	-2.0287831
O_3	-1.32083648(-3)	0.11108695	1.26350540(-3)	-9.4231152(-2)

*The notation 1.23(-3) denotes 1.23×10^{-3}

TABLE III-2

Temperature range applicable to zero-drift equations (Deg F)

	Helicopter Identification			
	20		30	
Species	Min	Max	Min	Max
NO	60	91	57	119
NO_x	60	91	57	119
CO	60	90.5	57	119
NMHC	60	91	57	119
CH_4	60	91	57	98
O_3	60	91	57	98

Pressure Correction

It was determined that the measurements for CO, total hydrocarbons, CH_4 and O_3 were subject to changes due to the lower atmospheric pressure which exists at altitudes above sea level. The effect of the lower pressure was to reduce the full scale value of the instrument reading. The factors shown in Table III-3 were applied to compensate for this effect in both helicopters. The correction was performed by dividing the original data by the factor given.

TABLE III-3

Factors used to correct for effects of low pressures at high altitudes

Species	Factor*	Altitude Range (ft MSL)
CO	1.0 - 4.02993(-5)h	0 - 10,000
THC	1.0 - 4.982951(-5)h	0 - 12,000
CH_4	1.0 - 5.136985(-5)h	0 - 12,000
O_3	1.0 - 1.61016949(-5)h	0 - 10,000

*h is the altitude in feet above mean sea level.

APPENDIX IV

DESCRIPTION OF LIDAR DATA

The LIDAR data were provided by System Innovation & Development Corporation. The LIDAR measured inversion height at various points in the Los Angeles Basin at different times of day. The data were provided on a reel of magnetic tape containing an operation code, time of day (hours and minutes), x-y coordinates in kilometers following the LARPP coordinate system, the LIDAR inclination angle, a measurement identification number, and the mixing layer height in meters.

The LIDAR data were treated in a manner different from the other data because the tape provided does not follow a uniform format. It is emphasized that the tape can be read and the data do not appear to be impaired in any way. However, the lack of uniformity in the data format requires painstaking record-by-record examination and special programming to overcome this difficulty. Both of these operations are beyond the scope of archiving. As a result, the LIDAR data have simply been copied, as provided to us, after the last operation of the LARP Program, Operation 46.

The nominal format of the LIDAR data record is given below.

TABLE IV-1

Nominal format of LIDAR data record

Character Position	Format	Content
1	I1	Mission Code*
2-5	I4	Local Time (HHMM)
6	I1	Character 0 (zero)
7-8	I2	X-Coordinate (km)
9-10	I2	Y-Coordinate (km)
11	1X	Blank
12-14	I3	LIDAR Inclination Angle (deg)
15-16	2X	Blank
17-22	I6	Case Number
23	IX	Blank
24-28	I5	Mixing Layer Height (meters)

*The mission code is a single-digit number assigned by System Innovation and Development which is supposed to identify the data of the measurement. The corresponding dates are given in Table IV-2.

TABLE IV-2

Mission codes and dates for LIDAR data

Run No.*	Mission Code	Date
1	1	100573
2	2	101073
3	3	101173
4	4	101273
5	5	101573
6	6	101673
7	7	101773
8	8	101873
9	9	102373
10	0	102473
11	1	102573
12	2	102673
13	3	102773
14	4	102973
15	5	103073
16	6	103173

*This is not a LARPP operation number.

Finally, we note that the LIDAR data blocks have 1280 characters and that there are 193 of them.

APPENDIX V

SPECIFICATIONS AND CONTENTS OF THE MAGNETIC TAPES

Tape Specifications

The LARPP archive has been stored on two types of magnetic tape whose specifications are given below.

	Tape Type I	Tape Type II
Number of Tracks	7	9
Bit Density (bits/inch)	800	1600
Number of Reels	3	2
Tape Length (feet)	2400	2400
Character Set	CDC Internal Display Code	CDC Internal Display Code
Bits per Character	6	6
Characters per Block	5120	5120
Parity	Even	Odd

Tape Contents

The contents of each tape reel are shown in Tables V-1 to V-3 for 7-track tapes and Table V-4 for 9-track tapes. Only the operation numbers are listed for the latter since the number of data records and the number of blocks per file do not change in going from 7 to 9 tracks.

TABLE V-1

Contents for reel number 1 for 7-track tape

Operation No.	Date	No. of Data Records	No. of Data Blocks
01	091173	2521	79
02	091273	3482	100
03	091373	3969	122
04	091773	5747	177
05	091873	6406	209
06	091973	7972	276
07	092073	7114	241
08	092473	8686	302
09	092573	7299	239
10	092773	6795	214
11	092873	5996	194
12	100173	7696	280
13	100273	3747	124
14	100473	5941	197
15	100573	6639	231
16	101073	12590	446
17	101173	11187	407

TABLE V-2

Contents of reel number 2 for 7-track tape

Operation No.	Date	No. of Data Records	No. of Data Blocks
18	101273	9497	339
19	101573	9496	339
20	101673	8380	307
21	101773	9660	320
22	101873	8138	270
23	102473	10130	366
24	102573	11276	408
25	102673	9589	343
26	102773	3476	120
27	102873	3860	130
28	102973	7062	258
29	103073	5274	181
30	103173	4509	152
31	110173	5397	191
32	110273	2506	85

TABLE V-3

Contents of reel number 3 for 7-track tape

Operation No.	Date	No. of Data Records	No. of Data Blocks
33	110573	7571	271
34	110673	3033	93
35	110773	5929	210
36	110873	2992	112
37	111273	1853	63
38	111373	6785	259
39	111473	9030	343
40	111573	3256	123
41	111273	3325	124
42	103173	3398	124
43	100973	5713	218
44	102373	4851	186
45	111673	1941	59
46	112073	2000	61
	* * * * * * * * * *		
†LIDAR DATA	-	-	193

†The LIDAR data are included in Reel No. 3 beginning after operation 46. There is a double end-of-file mark between operation 46 and the LIDAR data. See Appendix IV for a description of the LIDAR file.

TABLE V-4

Contents for reel number 1 for 9-track tape

Operation No.	Date
01	091173
02	091273
03	091373
04	091773
05	091873
06	091973
07	092073
08	092473
09	092573
10	092773
11	092873
12	100173
13	100273
14	100473
15	100573
16	101073
17	101173
18	101273
19	101573
20	101673
21	101773
22	101873
23	102473
24	102573
25	102673
26	102773
27	102873

TABLE V-5

Contents of reel number 2 for 9-track tape

Operation No.	Date
28	102973
29	103073
30	103173
31	110173
32	110273
33	110573
34	110673
35	110773
36	110873
37	111273
38	111373
39	111473
40	111573
41	111273
42	103173
43	100973
44	102373
45	111673
46	112073
†LIDAR DATA	-

†The LIDAR data are included in Reel No. 2 beginning after operation 46. There is a double end-of-file mark between operation 46 and the LIDAR data. See Appendix IV for a description of the LIDAR file.